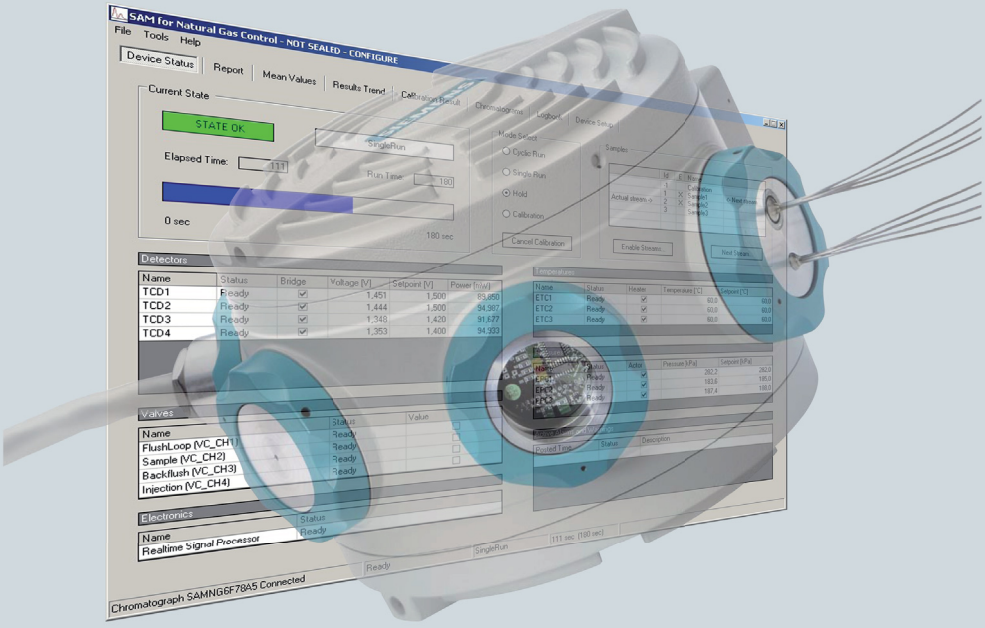
SITRANS CV

CVControl operating software

Operating Manual · 11/2012



Process gas chromatography

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Process Analytics

Process gas chromatograph CVControl operating software

Operating Manual

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7KQ3105

11/2012

A5E01428676-03

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

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The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

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Siemens AG
Industry Sector
Postfach 48 48
90026 NÜRNBERG
GERMANY

Order number: A5E01428676
Ⓟ 11/2012 Technical data subject to change

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Introduction

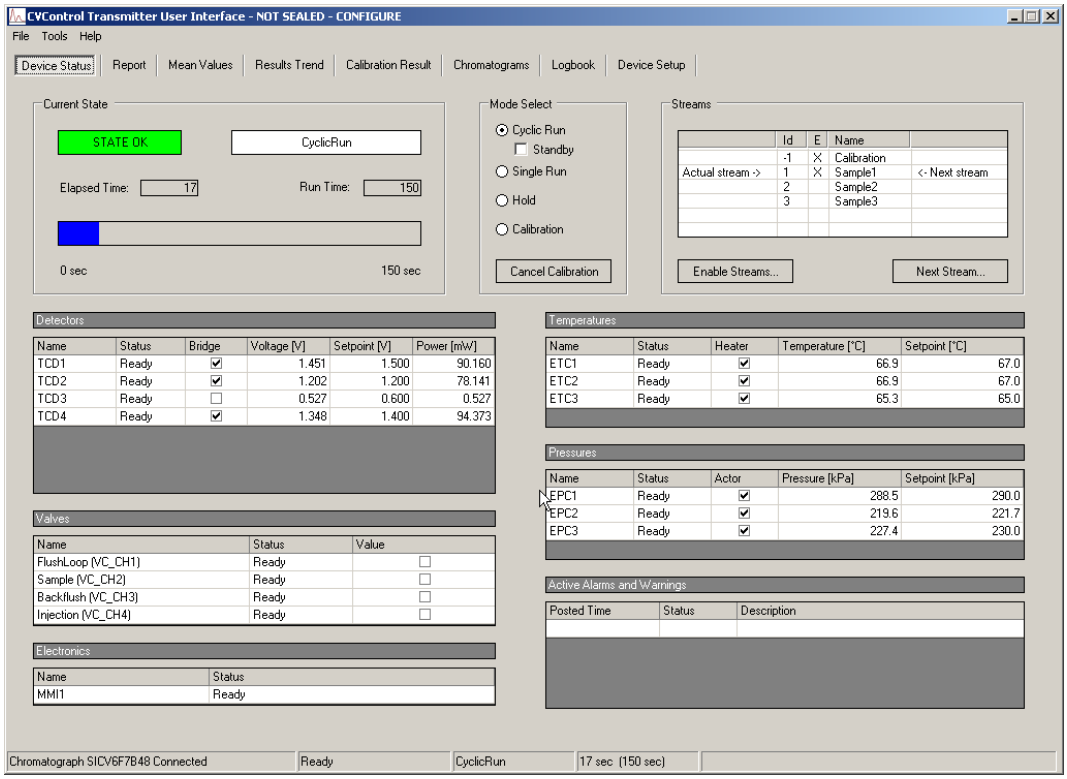
1

This manual describes the CVControl software for the SITRANS CV process gas chromatograph. The keyboard and screen are required to use the CVControl software.

The manual applies as of software version V02.01.00.

NOTICE
Qualified personnel Only qualified personnel may use the CVControl operating software and thus the SITRANS CV process gas chromatograph. Insufficient or no knowledge of the User's Manual results in cancellation of all liability claims toward Siemens AG. Owners are therefore recommended to have the training of personnel confirmed in writing.

Following installation and starting of the CVControl operating software, you see the following startup screen as the GUI for the SITRANS CV.



NOTICE
Leave factory settings unchanged! • Never change the factory settings of the functions. • If you nevertheless change the factory settings: – This corresponds to intentional manipulation and therefore a non-approved application of the device. – The accuracy of the measurements will become less exact. – The device may no longer match the certification. • The device is delivered non-calibrated. The calibration must be carried out by a calibration official or deputy at the location of use in the owner's country.

History

This history establishes the correlation between the current documentation and the valid firmware of the device.

Release	Remarks	Firmware ID
03 11/2012	Description of new functions	FW: 02.01.00
02 02/2010	Description of new functions	FW: 01.60.01
01 10/2007	First release	FW: 01.40.00

Installing the software

2

Note

Secure operation of the device

For its automation and drives product portfolio, Siemens provides IT security mechanisms to support secure operation of the plant/machine.

However, for secure operation of a plant/machine, it is necessary to integrate the automation components into a holistic IT security concept for the entire plant/machine.

You can find information on this at:
http://www.siemens.com/industrialsecurity ()

Note

Malfunctions resulting from older versions of the software described here in the device or on the PC

Observe the installation instructions of the software described here on the supplied CD.
If necessary, uninstall any older versions prior to installation of the new software.

2.1 Operating software and requirements placed on the chromatograph

CVControl operating software

CVControl is the operating software for the SITRANS CV process gas chromatographs. This is a measuring instrument for the calorific value and composition of combustion gases such as natural gas or biogas.

The CVControl software program contains the following functionalities described in the User's Manual:

- Calibration
- Automatic optimization of method
- Status
- Logbook
- Analysis control and operating modes
- Viewing and analysis of measured values
- Transmission of results over Modbus
- Loading and saving the parameters

Installation requirements

- At least the following hardware and firmware versions must be installed in the chromatograph:
  - CAC A5E01052942
  - RSP hardware A5E00315395
  - RSP firmware 00014024
  - SITRANS CV as of version 2.01.00
- CVControl can only be used with the following Siemens chromatographs:
  - SITRANS CV
- The following Siemens chromatographs are **not** supported by CVControl:
  - MAXUM edition II
  - MicroSAM

2.2 Minimum PC requirements

- Pentium 800 MHz
- 128 MB RAM, 256 MB recommended
- Hard disk: 250 MB vacant capacity, depends on data quantity produced.
- CD-ROM or DVD drive.
- Graphics card and monitor with 1024 x 768 pixels resolution and 16-bit color depth. Display of fonts in normal size.
- Mouse and keyboard.
- Network card, or Ethernet interface integrated on the motherboard.
- Windows XP or Windows 7 operating system.

2.3 Installing the operating software

Note

Administrator privileges are necessary for installation of the CVControl software program.

Scope of delivery

The scope of delivery of the software package includes the following CDs:

- Control software
- Country Specific Setups
- Parameter Backup

Installing the software

Procedure:

1. Turn on the PC and start Windows.
2. Place the Control Software CD into the drive. If the installation program on the CD does not start up automatically, start the setup.exe program in the folder "Workstation" on the CD.
3. Follow the onscreen instructions of the installation program.

Note

Recommended installation path

The software is automatically installed by the installation program in the directory c:\Program Files\Siemens AG\CVControl\.
Do not change the suggested path. If you have support inquiries, the Siemens AG employees will find and solve problems more easily with the standard installation.

Loading and saving parameters

Note

Changing device parameters

All changes in the factory settings are written by the gas chromatograph in the logbook as a signature. The calibration official need only check the signature in the logbook. If the signature has changed, the factory settings have also been changed.

- The parameters which have been factory-set for your chromatograph are saved on the CD "Parameter Backup". If you have changed parameters unintentionally and wish to restore the factory parameters, download the parameters from this CD into the gas chromatograph again.
- In the opposite direction, you can also save parameters from the gas chromatograph onto the hard disk of the operating PC.
- If you are using a new calibration gas cylinder, you must match the component concentrations. The procedure is described in Section Requirements for calibrating (Page 34). .

Loading parameters

1. Place the CD "Parameter Backup" with the parameters for system restoration into the CD drive.
2. Select the "Load Setup" command in the "File" menu.
3. Select the file Setup-xx-xx-yyy.mbb.
   – xx-xx-yyy corresponds to the serial number of your chromatograph.

Note

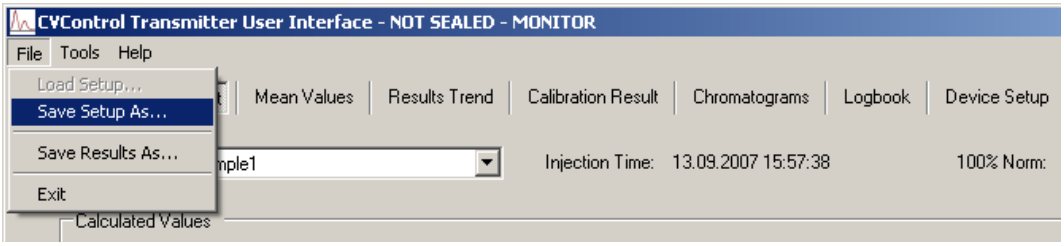
Do not switch off the chromatograph during the saving process

The following message is displayed in the status line for about one minute: "Flash pending". The chromatograph then saves the data into the Flash memory.

The save process takes about 20 seconds, and is indicated by the message "Flashing". If you switch off the device during this phase, or if the power supply fails, the data in the memory are of no use.

Saving parameters

1. Select the "Save Setup As" command in the "File" menu.



2. Select a directory and a file name. If you have loaded country-specific settings, these will now be saved together with the basic parameters.

2.4 Setting the IP addresses

Note

Firewall

If a firewall is activated in the network, this may possibly block establishment of the connection.

Therefore match the firewall to your network topology.

Note

Administrator privileges

You require administrator privileges on your computer in order to set the IP address of your PC. Ask your system administrator, or read the Windows help.

For communication between the PC and the gas chromatograph, set the IP address of the chromatograph such that it matches the IP address of the PC.

2.4.1 Changing the IP address of the chromatograph

- The factory-set IP address in the gas chromatograph is 161.218.51.xx.
  "xx" corresponds to the last two digits of the serial number on the rating plate.
- The preset subnet mask is 255.255.255.0.

Example:

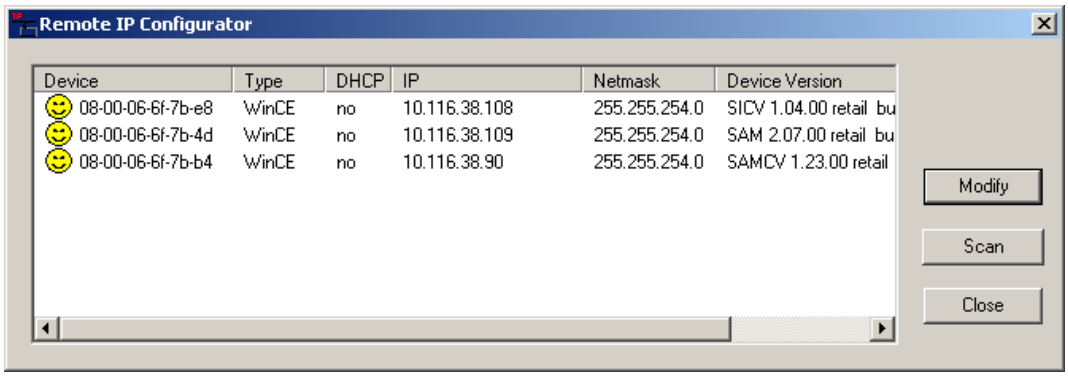
If the serial number of the gas chromatograph is HX R5 3**47**, the IP address is then 161.218.51.**47**.

Procedure

NOTICE
Device damage through incorrectly set network transmission rate • Set a **maximum of 10 Mbps** for the network transmission rate. • If you set a higher rate than 10 Mbps, the device will be damaged and no longer function correctly. • You must then return the device to Siemens AG for repair.

If you require an IP address and subnet mask for the device other than the preset values:

1. Start the program "Remote IP Configurator"
   (start bar **Start → Programs → Siemens AG → CVControl → Tools → RemoteIPConfig**).



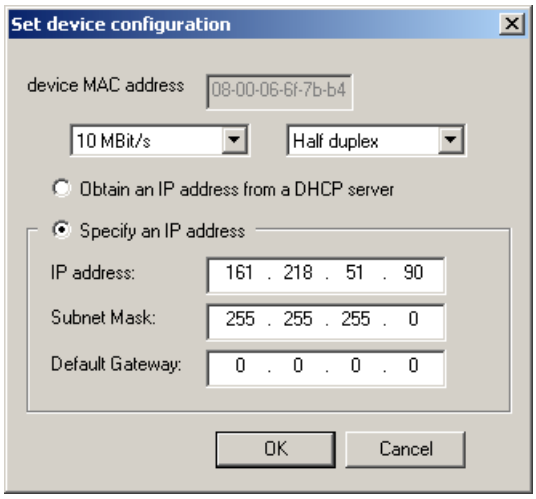
2. Click the "Scan" button.

Note

No gas chromatograph visible in the "Remote IP Configurator"

If no chromatograph appears, check the physical connections.
A common physical network with hub/switch must be present.
If a PC with several network adapters is used, make sure that the network connection is assigned correctly.

3. Select the desired chromatograph under "Device".
4. Click on "Modify". The "Set device configuration" dialog box opens.



5. Specify the desired IP address and the desired subnet mask.
6. Confirm with "OK".
7. Exit the program "Remote IP Configurator" using "Close".

Restart

Following confirmation with "OK", the gas chromatograph restarts automatically.

2.4.2 Setting the IP address of the PC

Procedure

1. Start the program "Network connections" (start bar **Start → Control Panel → Network connections**).
2. Click on the right on the associated Ethernet connection, e.g. "Local Area Connection (2)".
3. Select "Properties" in the dialog box.
4. Click in the list on "Internet Protocol (TCP/IP)", and then the button "Properties".
5. Select the checkbox "Specify an IP address", and enter the IP address and subnet mask.

2.5 SITRANS CV software upgrade

Note

Only start a **software upgrade when** this is **absolutely necessary**, e.g. if the new software functions are essential for the gas chromatograph.

A software upgrade could possibly result in malfunctions on your gas chromatograph, and you would then have to adapt and parameterize it for the new functions.

Note

Upgrading the Flash memory

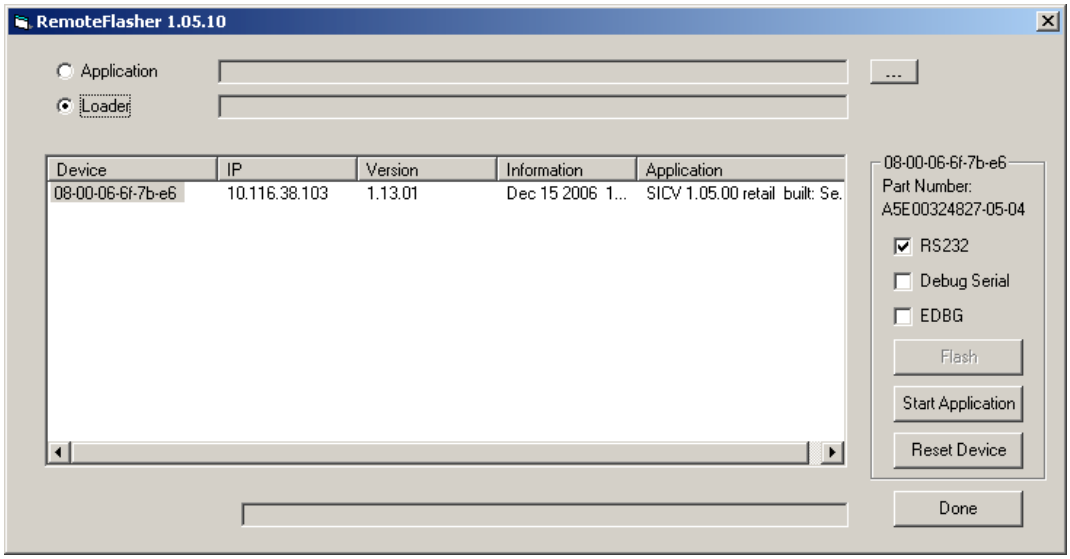
- Back up all data and device parameters before starting a software upgrade. All data present in the Flash memory are permanently deleted by the software upgrade.
- Upgrading of the SITRANS CV process gas chromatograph is only permissible if a corresponding supplement for the device is present in your local approval.
- Never interrupt the Flash process, since the Flash memory in this case can only be reestablished by Siemens AG.

Requirements

The SITRANS CV process gas chromatograph, the PC and the Windows operating system are in operation.

Procedure for upgrading the Flash memory

1. Start the program "RemoteFlasher"
   (Start bar **Start → Programs → Siemens AG → CVControl → Tools → RemoteFlasher**).



2. Click "...", and select the CELO-x.y.BIN file (x.y = version number) from the "Operating System" directory of the "Control Software".
3. Interrupt the power supply for about one second.
4. Wait until the device is indicated under "Device", and then select it.
5. Select the option button "Loader" and activate the option box "RS232".
6. Click on the "Flash" button, the software upgrading of the Flash memory will then begin. The procedure terminates with the message "Flashed". The message appears at the bottom left in the corner of the dialog box "RemoteFlasher".
7. To conclude, click the "Reset Device" button.

2.5.1 Transferring the operating system to the device

Procedure

1. Click "...", and select the SICVxyyzz file (xyyzz = version number ⇒ 20000 or higher) from the "Operating System" directory of the "Control Software".
2. Select the desired process gas chromatograph under "Device" in the window "RemoteFlasher".

   Note

   If the device is not displayed, switch off the power supply for approx. 10 seconds using the external power switch. Then switch on the power supply again, and wait until the device is displayed.

3. Activate the option box "RS232".
4. Click on the "Flash" button, the "RemoteFlasher" program will then transfer the operating system. The procedure is concluded by the message "Flashed". The message appears at the bottom left in the corner of the dialog box "RemoteFlasher".
5. To conclude, click the "Reset Device" button.
6. Exit the program "RemoteFlasher" using the "Done" button.

The SITRANS CV software upgrade has now been completed.

2.6 Selecting the chromatograph

Note

The CVControl operating software only communicates with one chromatograph.

Therefore set the IP address for the chromatograph you wish to operate in the file "NGControl.config".

The communication settings are defined in a configuration file.

Procedure

Note

- To display the directory "Local Settings" in the Windows Explorer, set the following option in the tab "Tools ➜ Folder options ➜ View ➜ Hidden files and folders": "Display all files and folders".
- If several users operate the chromatograph with their own access, each user must carry out this procedure because the configuration file is saved in the user profile.

1. So that this configuration file NGControl.config is generated automatically, you must start the CVControl once and exit it again.
2. Browse for the configuration file NGControl.config using the Windows search function under "C:\Documents and Settings\...".
3. Open the configuration file NGControl.config using the Windows Editor. The first lines look as follows:

```
<?xml version="1.0" encoding="utf-8"?>
<UISettings xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
 <IP Number>161.218.51.47</IP Number>
   <Port Number>8500</Port Number>
   <CSVFi le>C:\Program Files\Siemens
AG\SamNG\Bin\DataLogging\Data.csv</CSVFile>
```

1. Enter the IP address of your chromatograph in the line <IP Number>. Otherwise do not change anything, and then save the file.

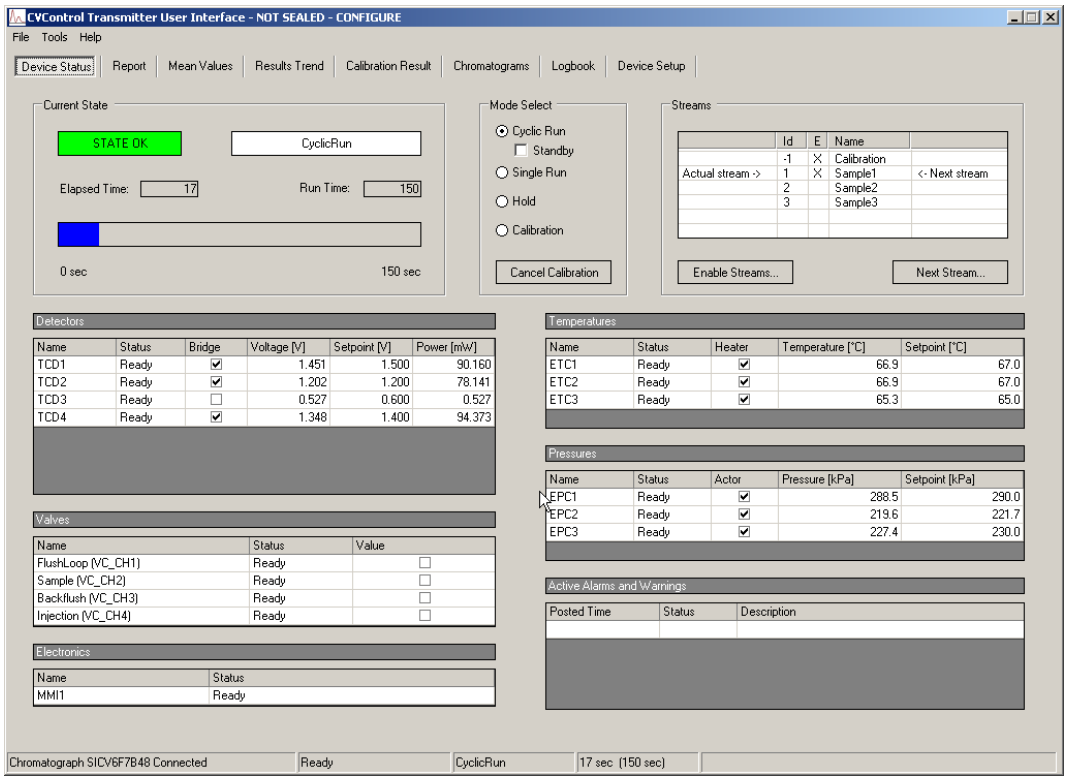
2.7 Restoring data

2.7.1 Restoration of the application data

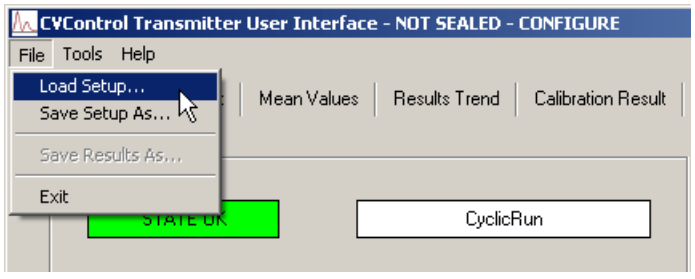
Execute the CVControl operating software in order to restore your application data.

Procedure

1. Start the program "CVControl"
   (start bar **Start ➜ Programs ➜ Siemens AG ➜ CVControl ➜ CVControl**).



2. Select the "Load Setup..." command in the "File" menu.



3. Load your previously saved configuration data.
4. Check the configuration and functionality of your device in accordance with the following section of this manual.

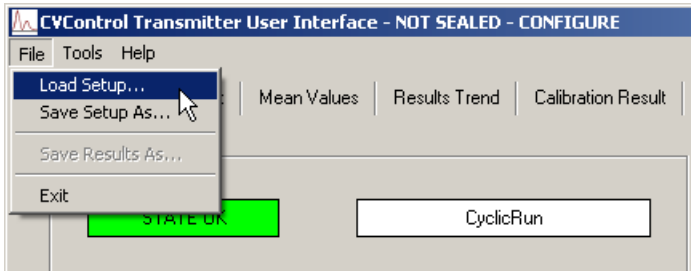
2.7.2 Installing the country-specific settings

Country-specific setups are predefined device configurations which set the device appropriate to the required measurement in accordance with the gas composition and method of calculation. Detector settings and pressures of the analysis module are not part of the setup and therefore remain unchanged.

Installing the country-specific settings

1. Check that the process gas chromatograph, the PC and the Windows operating system are in operation.
2. Place the CD "Country Specific Setups" into the CD drive.
3. Start the program "CVControl"

   (start bar **Start ➜ Programs ➜ Siemens AG ➜ CVControl ➜ CVControl**).
4. Select the "Load Setup..." command in the "File" menu.



5. Select the corresponding file on the CD for the desired measurement.

   The "Readme.pdf" file in the root directory of the CD contains a list of available device configurations for various countries and the standardized methods of calculation. The measurements and the requirements for calibration are also described in detail here.

Note

Data loss

A system restore with data from the parameter backup CD overrides the country-specific setup in the manner described here.

See also

Calibrating (Page 33)

Optimization of method (Page 51)

Transmission of results over Modbus (Page 105)

2.7.3 Setting the calibration gas

Requirements

The composition of the calibration gas must match the optimization instructions of the country-specific setting.

Also refer to the 'Readme.Pdf' file on the CD 'Country Specific Setup'.

Procedure

Proceed as follows:

1. Enter the concentration of the calibration gas.
2. Calibrate and optimize the device according to the information in the Sections: " Calibrating (Page 33) ff." and "Optimization of method (Page 51) ff."
3. Check the repeatability.

2.7.4 Parameterization and saving of Modbus

See Section: " Transmission of results over Modbus (Page 105) ff."

Operation

3

Requirements for operation:

- The chromatograph must be correctly connected to the PC.
- The CVControl software must be installed.
- The IP address of the chromatograph must match the PC.

3.1 Fundamentals for operation

Which parameters you can change depends on the operating mode.

- In "MONITOR" mode, most of the operating functions are disabled to prevent errors in measurement due to unintentional operations. It is still possible, for example, to change the enabling of samples.
- In "CONFIGURE" mode, all parameters can be accessed.

The tabs of the "CVControl" window listed below are used to check correct functioning of the chromatograph or to view the results:

- "Device Status"
- "Report"
- "Mean Values"
- "Results Trend"
- "Calibration Result"
- "Chromatograms"
- "Logbook"

Complete parameterization of the chromatograph is possible in the tab "Device Setup". Parameterization may only be carried out by experts or calibration officials.

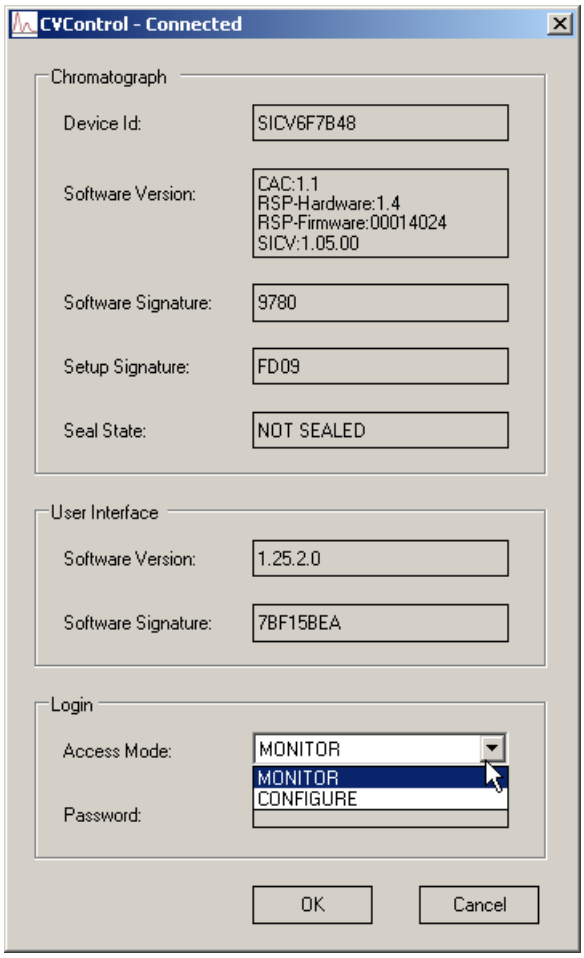
NOTICE
Leave factory settings unchanged! • The factory settings of the functions must not be changed by the user. • If the factory settings are changed nevertheless: – This corresponds to intentional manipulation and therefore a non-approved application of the device. – The accuracy of the measurements will become less exact. – The device may no longer match the certification. • The device is delivered non-calibrated. The calibration must be carried out by a calibration official or deputy of the country in which the device is used.

3.2 Starting of operation

Procedure

1. Start the program "CVControl"
   (start bar **Start → Programs → Siemens AG → CVControl → CVControl**).

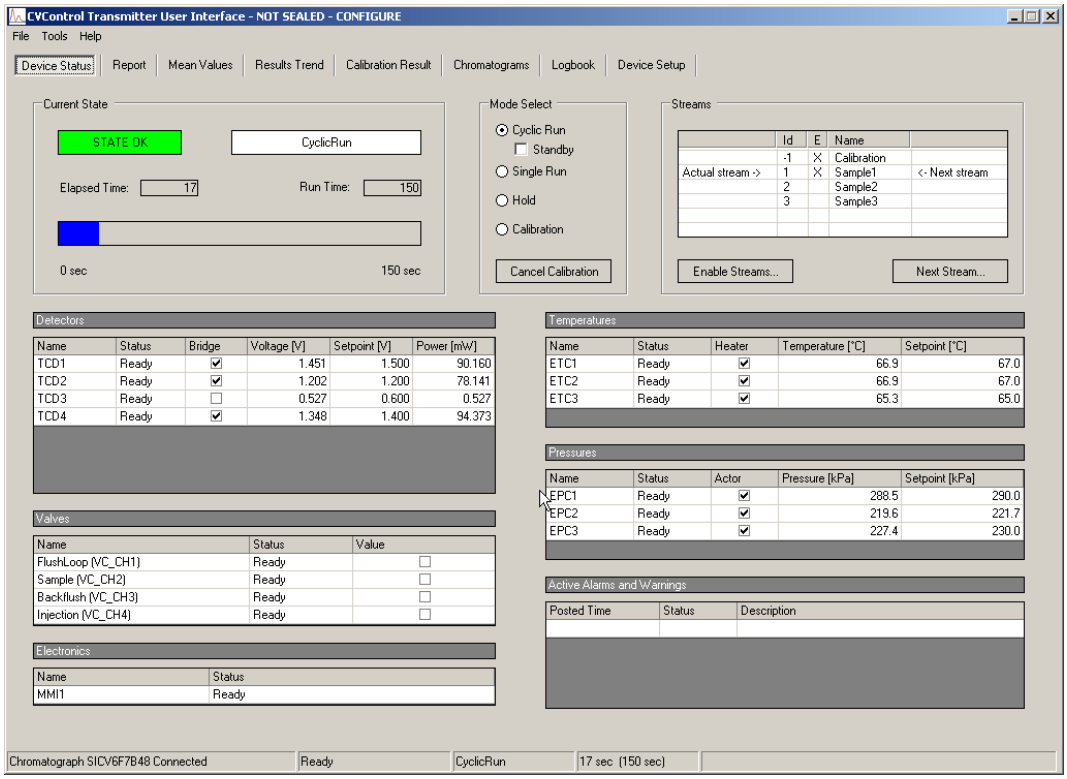
   The program requires about 5 seconds to load the Start dialog box.



2. In the start dialog box "CVControl", select an **operating mode** in the drop-down list "Access Mode":
   - "MONITOR"
   - "CONFIGURE"

3. Confirm your selection with "OK".

   The "CVControl Transmitter User Interface" window is displayed.



3.3 Locking of operation for calibrated mode

Note

Noting of password

- Each password can only be used once. When locking is repeated, a new password must be assigned.
- If you forget the password, you cannot leave calibrated mode.

1. If the chromatograph is to work in calibrated mode, the calibration official will assign a password (Tools menu ➞ Set new password).
   – "Access Mode" must be set to "MONITOR".
2. In calibrated mode, you can only use "MONITOR" mode. In "MONITOR" mode, only a few parameters can be changed, e.g. the enabling of samples.
3. Calibrated mode is exited as soon as you change to "CONFIGURE" mode using the password (menu **Tools ➞ Change Access Mode**).

Note

You can also use the lock in non-calibrated mode, e.g. to protect against unauthorized access.

3.4 Entering the parameters

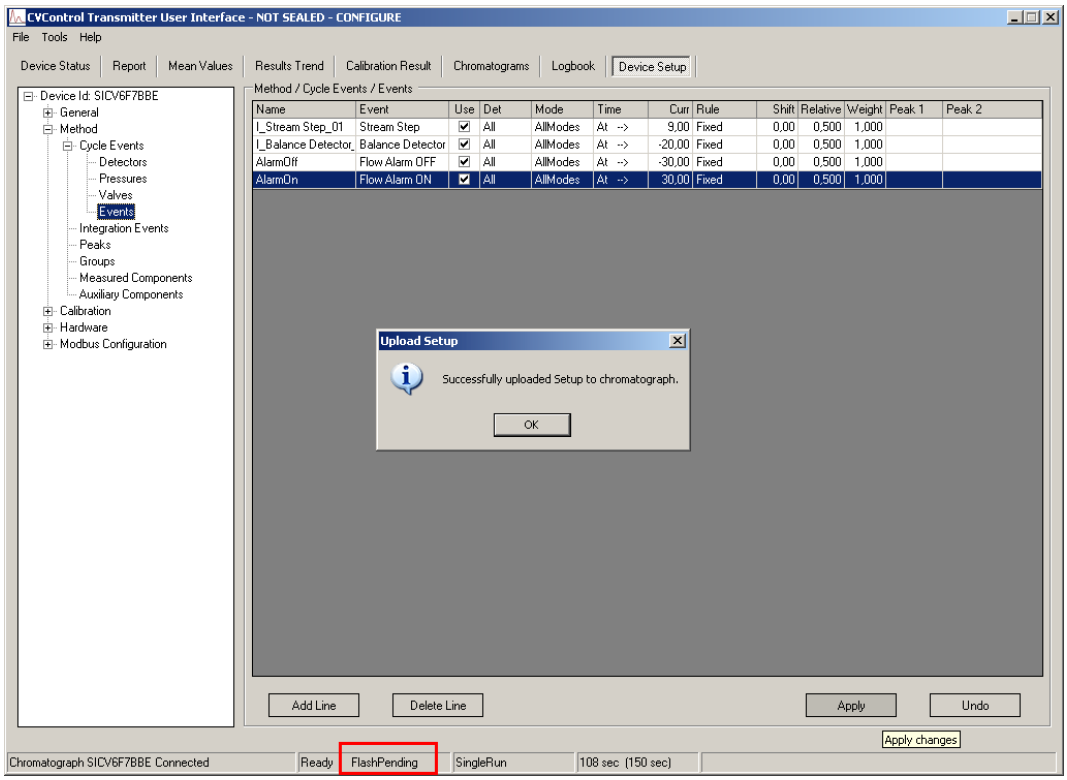
Parameters can be:

- Numerical values
- Commands
- Logical values (yes, no, positive, negative)

Note

Changing of parameters

- Certified mode: Make sure when changing parameters that the certificate remains valid despite the change. The parameters are described in the certificate.
- You must click the "APPLY" button following each change. If you change several parameters on a tab, you must click "APPLY" and "OK" at the latest before leaving the tab.



After clicking the "APPLY" button, the note "Flash pending" is displayed in the status line for about three minutes.

- During this time, the chromatograph waits for further inputs.
- It then saves the data into the Flash memory. Data saving takes about 20 seconds, and is indicated by the message "Flashing".
- If you switch off the device during this phase, or if the power supply fails, the data in the memory are of no use.

Entering numerical values

1. Click in the input box.
2. Enter the value using the digit keys.

Entering logical values, names or numbers from a drop-down list

Click in the parameter box, and then on the arrow on the right in the input box. A drop-down list is displayed. Click on the desired value in this list.

Commenced input

The input is not effective until you click on the "APPLY" button, the existing values still applies. You recognize this in that the "APPLY" and "UNDO" buttons are still active and not pale as was the case **prior** to commencement of inputs.

Incorrect input

- An incorrect numerical input can be deleted in steps using the **backspace key** on the PC keyboard.
- Drop-down lists can be exited by clicking in a different box.
- It is sometimes the case that a commenced input cannot be exited. You must then continue to the end of the input cycle, and subsequently click the "UNDO" button. The previous value is then displayed again.

Input during ongoing analysis

The terms "Setpoint" and "Setpoint Initial" are present in many windows. Inputs are only possible in the "Setpoint Initial" box. As soon as the ongoing analysis has been completed, the gas chromatograph first copies this value to "Setpoint". The modification is therefore always only active in the next analysis.

Calibrating

4

4.1 Overview

Note

The calibration sample should correspond to the gas used unless your certificate specifies something else. This procedure results in the best performance for your device.

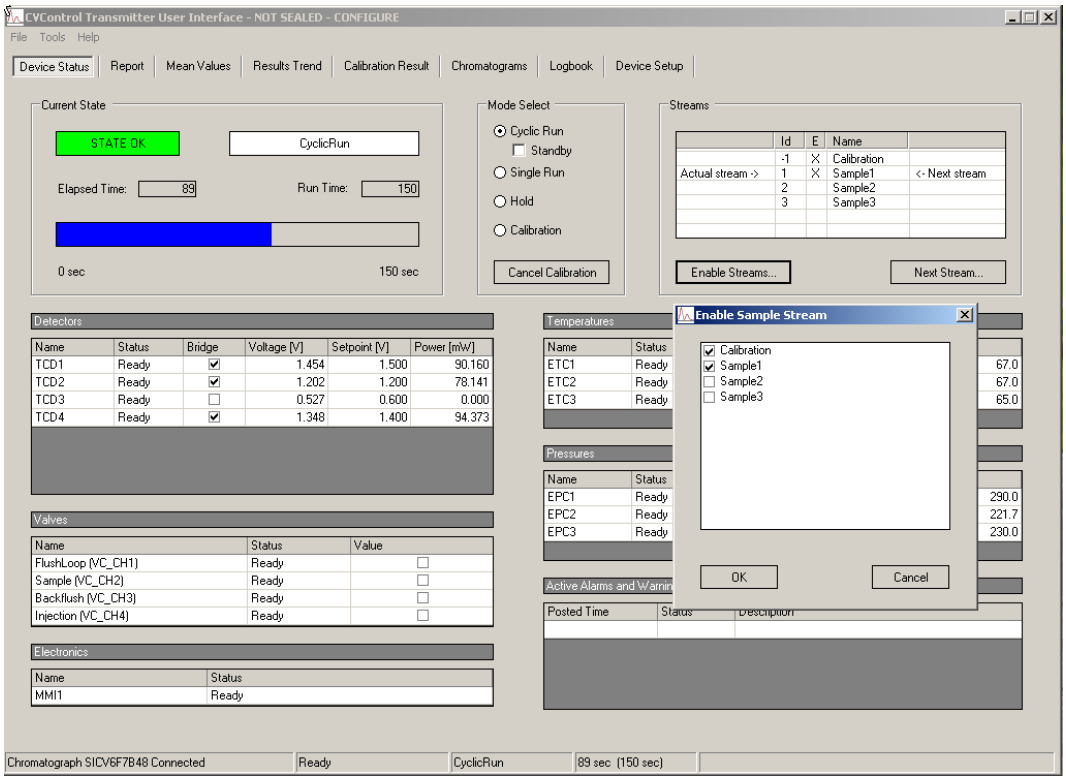
Procedure

1. To carry out a calibration, you analyze a calibration sample of known composition. Make sure that the composition of the calibration sample corresponds to the requirements of your local approval and the data in the 'Readme.pdf' file on the CD 'Country Specific Setup'.
2. Enter the concentrations of the components.
   - The chromatograph then calculates the calibrated response factor for each component from the ratio between concentration and peak area.
   - For details, refer to Section Calculation formulae (Page 102).

4.2 Requirements for calibrating

Preparing the calibration

1. The calibration flow must be activated in the CVControl operating software. If this is not the case, click on the "Enable Streams" button on the right in the tab "Device Status".

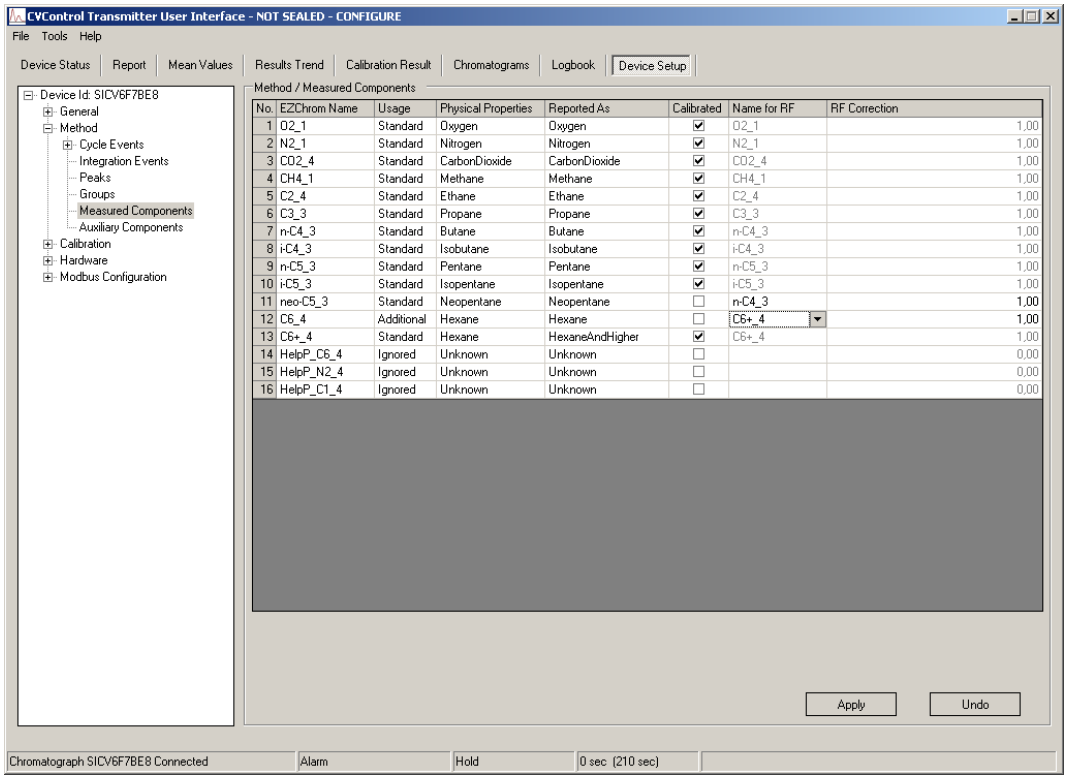


2. A column "Calibrated" is present in the component list (**Device Setup ➜ Method ➜ Measured Components**). Here you must mark all components to be calibrated with a tick.
   - Only the Calibrated marked components are calibrated.
   - Components which are not to be calibrated Calibrated must have a response factor (RF) assigned to them.
   - Components which are to be neither measured nor calibrated, are set to "Ignored".
   - Components used to calculate the calorific values are set to "Standard".
   - Components not used to calculate the calorific values are set to "Additional".

Note

Adding new components

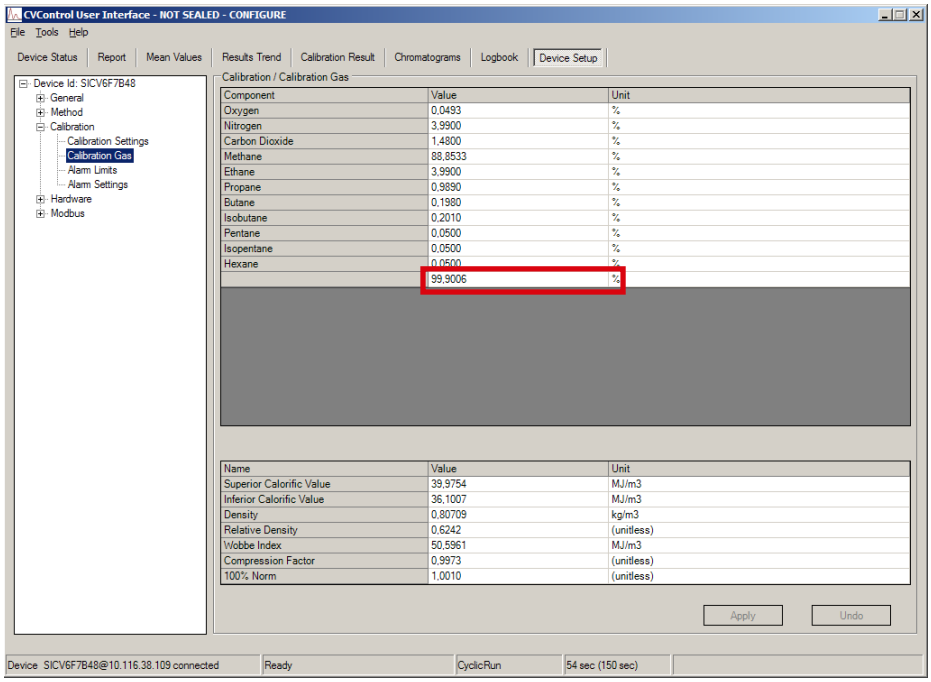
- New components (peaks) are first assigned in the navigation area under the group "Method" and the property object "Peaks". The new components are then listed under "Measured Components".
- Certified mode: Entry of a new component may make the certificate invalid.


CVControl Transmitter User Interface - NOT SEALED - CONFIGURE
File Tools Help
Device Status Report Mean Values Results Trend Calibration Result Chromatograms Logbook Device Setup
Device Id: SICV6F7BE8
General
Method
Cycle Events
Integration Events
Peaks
Groups
Measured Components
Auxiliary Components
Calibration
Hardware
Modbus Configuration
Method / Measured Components
No. EZChrom Name Usage Physical Properties Reported As Calibrated Name for RF RF Correction
1 O2_1 Standard Oxygen Oxygen O2_1 1,00
2 N2_1 Standard Nitrogen Nitrogen N2_1 1,00
3 CO2_4 Standard CarbonDioxide CarbonDioxide CO2_4 1,00
4 CH4_1 Standard Methane Methane CH4_1 1,00
5 C2_4 Standard Ethane Ethane C2_4 1,00
6 C3_3 Standard Propane Propane C3_3 1,00
7 n-C4_3 Standard Butane Butane n-C4_3 1,00
8 i-C4_3 Standard Isobutane Isobutane i-C4_3 1,00
9 n-C5_3 Standard Pentane Pentane n-C5_3 1,00
10 i-C5_3 Standard Isopentane Isopentane i-C5_3 1,00
11 neo-C5_3 Standard Neopentane Neopentane n-C4_3 1,00
12 C6_4 Additional Hexane Hexane C6+_4 1,00
13 C6+_4 Standard Hexane HexaneAndHigher C6+_4 1,00
14 HelpP_C6_4 Ignored Unknown Unknown 0,00
15 HelpP_N2_4 Ignored Unknown Unknown 0,00
16 HelpP_C1_4 Ignored Unknown Unknown 0,00
Apply
Undo
Chromatograph SICV6F7BE8 Connected
Alarm
Hold
0 sec (210 sec)

3. You must enter the concentrations of the calibration gas components.

Entering concentrations of calibration gas components

1. In the window "CVControl" of the tab "Device Setup", first click on the left in the navigation area on "Calibration" and then on "Calibration Gas".



2. Enter the corresponding concentration value in percent for the associated components in the "Value" column. Confirm the input using the **Enter key** on the PC keyboard.

Note

The total of the concentrations is displayed in the last line of the component table. The total is usually 100%.

---

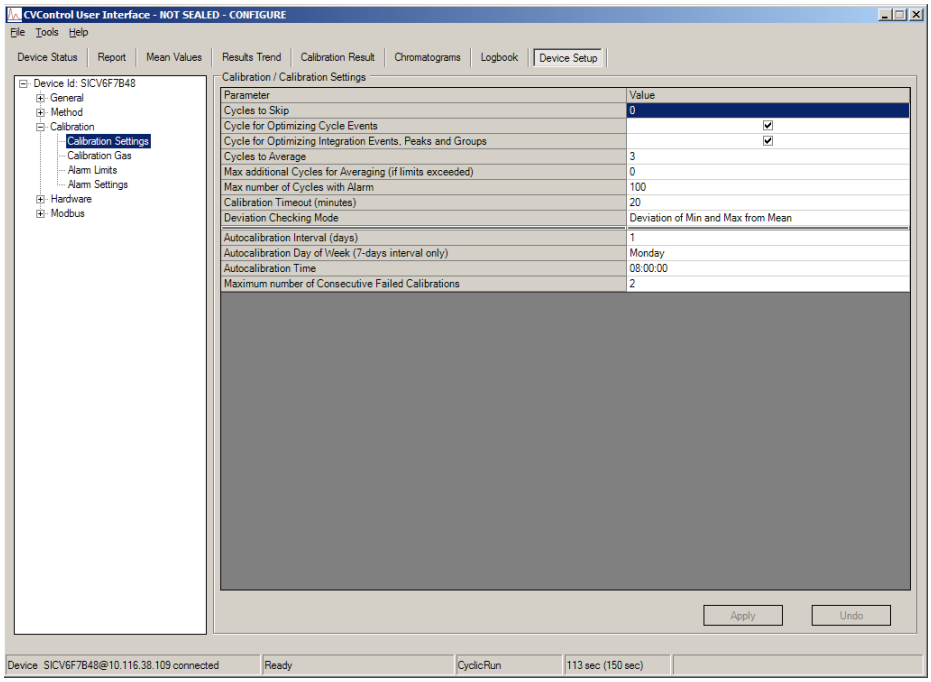
3. Click the "Apply" button when you have entered all values.
   - The chromatograph then automatically updates the bottom table in the window with the calorimetric values of the calibration gas.

Entering units

The unit for the component concentrations is fixed as percent for the calculation method in accordance with ISO 6976. The units of the calorimetric values in the bottom table can be selected in the tab "Device Setup" in the navigation area under "General" and "Units".

Parameterization of calibration cycle

1. In the window "CVControl" of the tab "Device Setup", first click on the left in the navigation area on "Calibration" and then on "Calibration Settings".



2. Enter the parameters. Confirm the input using the **Enter key** on the PC keyboard. Click the "Apply" button when you have entered all values.

Description of parameters

- **Cycles to skip**

  Number of initial analyses carried out prior to the valid calibration cycles and whose results are rejected.

- **Cycle for Optimizing Cycle Events**

  Additional analysis used for optimization of method, see Section " Optimization of method (Page 51) ".

- **Cycle for Optimizing Integration Events, Peaks & Groups**

  Additional analysis used for optimization of method, see Section " Optimization of method (Page 51) ".

- **Cycles for Averaging**

  Specifies how many analyses are to be used to determine the average value.

- **Max. additional cycles for averaging (if limits exceeded)**

  Specifies how many additional cycles are executed if the limit monitoring function has been triggered.

- **Max. number of cycles with alarm**

  Specifies the maximum number of analyses of the calibration mixture which may be repeated following a device alarm.

- **Calibration Timeout (minutes)**

  Maximum duration of a complete calibration including all applicable repetitions resulting from the above-mentioned points.

- **Deviation checking mode**

  Specifies the deviation strategy according to which the result of the calibration is to be evaluated. The following are possible:
  - Deviation of Min from Max: deviations between minimum and maximum are evaluated.
  - Deviation of Min and Max from Mean: deviations of minimum/maximum from mean value are evaluated.

- **Autocalibration Interval (days)**

  Specifies the interval between two calibration cycles in days.

- **Autocalibration DayOfWeek (7-days Interval only)**

  Specifies the day of the week of the calibration if "Autocalibration Interval (days)" is 7.

- **Autocalibration Time**

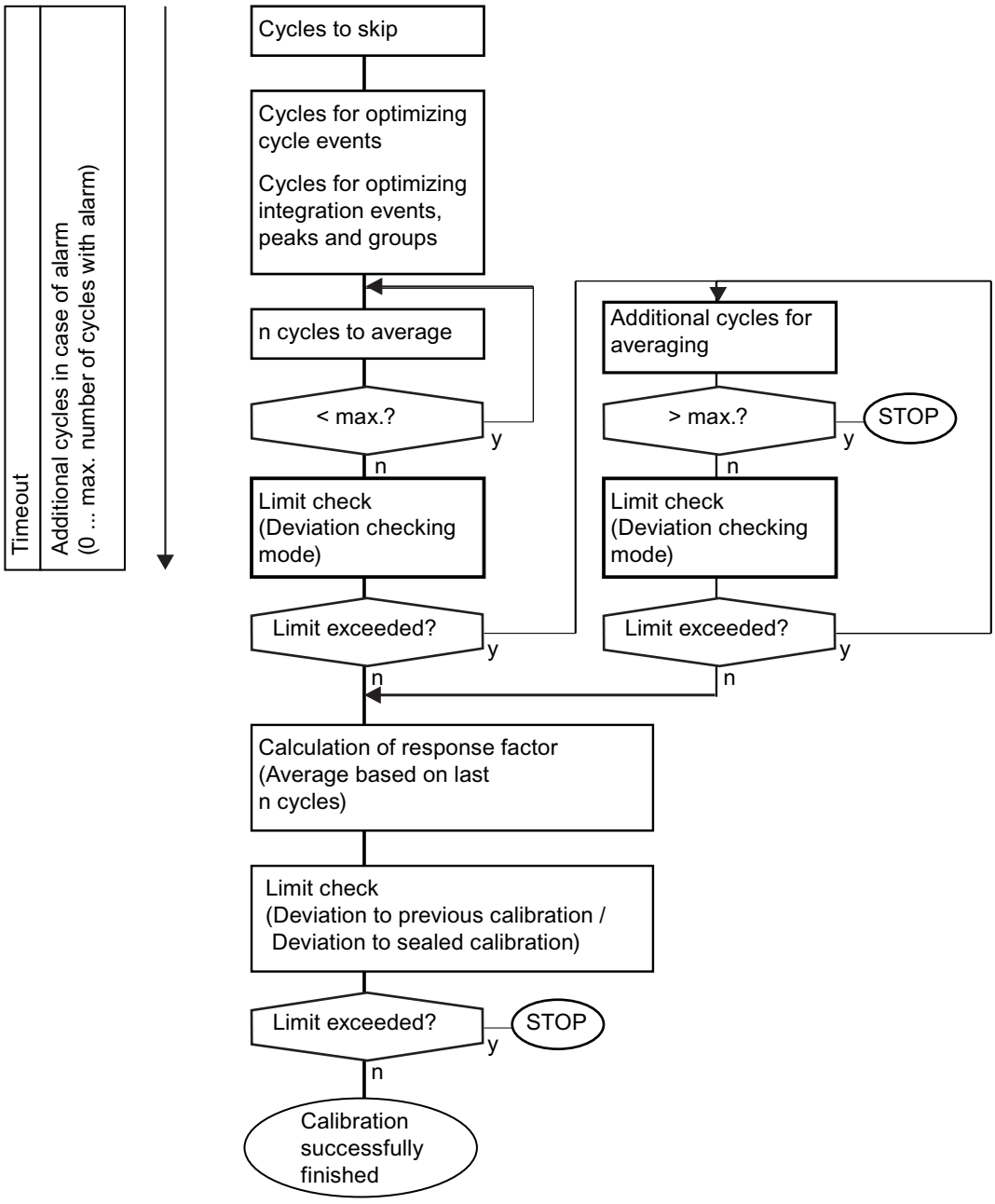
  Specifies the time at which the calibration cycle is to start.

- **Maximum number of consecutive failed calibrations**

  Maximum number of faulty calibrations permissible in succession.

Calibration sequence

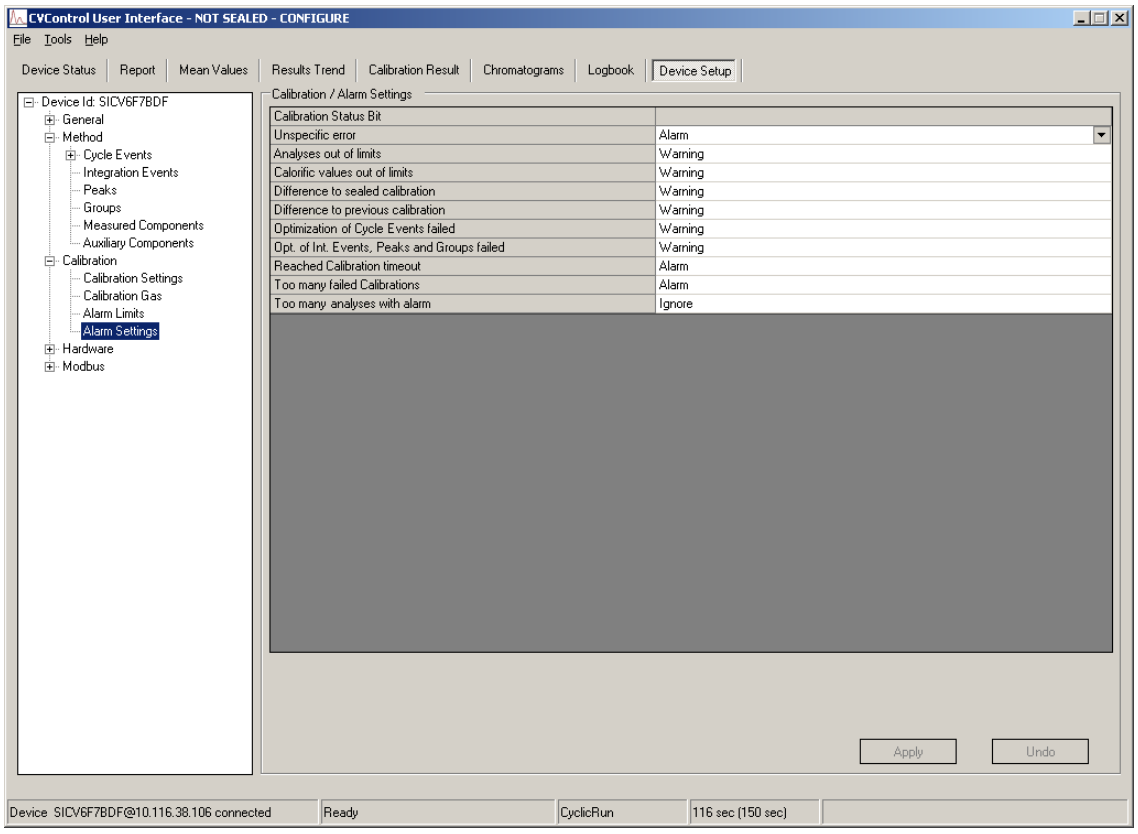
The figure below illustrates the calibration sequence:



Setting the detail alarm of the calibration

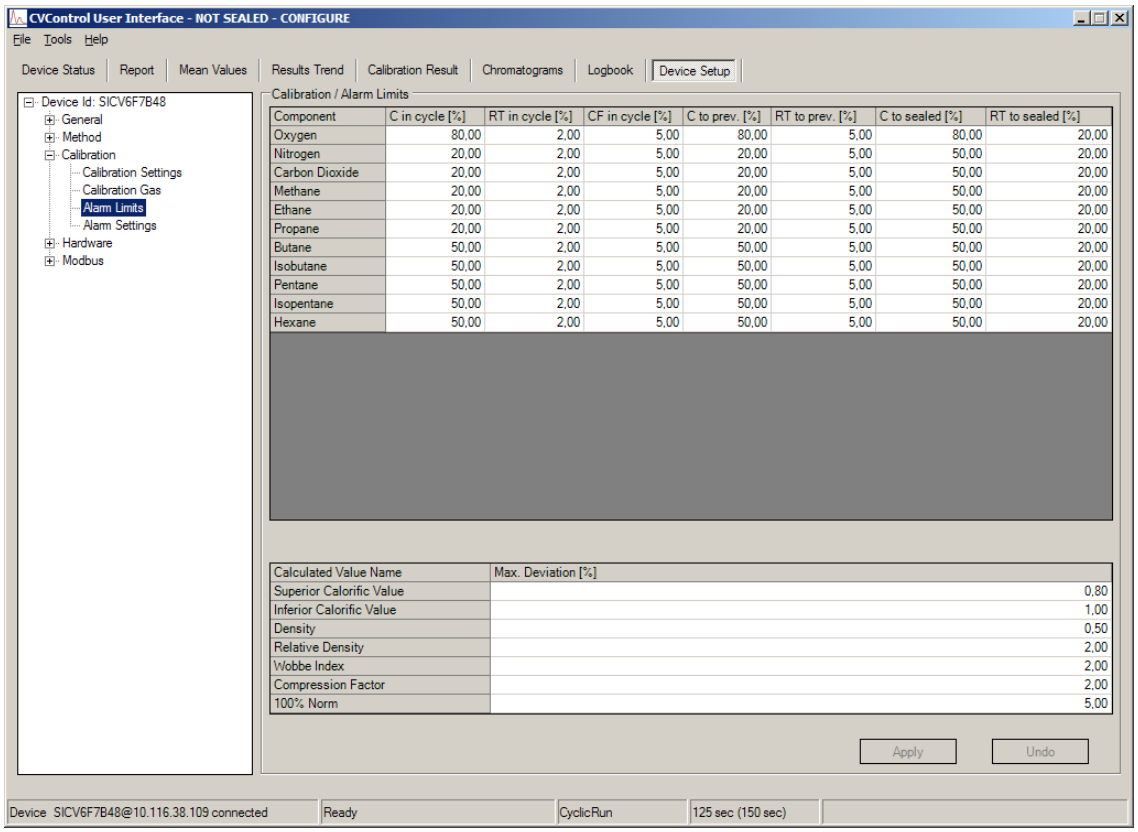
You can individually assign the significance of the alarm to each function:

- "Ignore"
- "Warning"
- "Alarm"



Parameterization of limits

1. In the window "Device Setup" first click on the left in the structure on "Calibration" and then on "Alarm Limits".


CVControl User Interface - NOT SEALED - CONFIGURE
File Tools Help
Device Status
Report
Mean Values
Results Trend
Calibration Result
Chromatograms
Logbook
Device Setup
Device Id: SICV6F7B48
General
Method
Calibration
Calibration Settings
Calibration Gas
Alarm Limits
Alarm Settings
Hardware
Modbus
Calibration / Alarm Limits
Component | C in cycle [%] | RT in cycle [%] | CF in cycle [%] | C to prev. [%] | RT to prev. [%] | C to sealed [%] | RT to sealed [%]
Oxygen 80,00 2,00 5,00 80,00 5,00 80,00 20,00
Nitrogen 20,00 2,00 5,00 20,00 5,00 50,00 20,00
Carbon Dioxide 20,00 2,00 5,00 20,00 5,00 50,00 20,00
Methane 20,00 2,00 5,00 20,00 5,00 50,00 20,00
Ethane 20,00 2,00 5,00 20,00 5,00 50,00 20,00
Propane 20,00 2,00 5,00 20,00 5,00 50,00 20,00
Butane 50,00 2,00 5,00 50,00 5,00 50,00 20,00
Isobutane 50,00 2,00 5,00 50,00 5,00 50,00 20,00
Pentane 50,00 2,00 5,00 50,00 5,00 50,00 20,00
Isopentane 50,00 2,00 5,00 50,00 5,00 50,00 20,00
Hexane 50,00 2,00 5,00 50,00 5,00 50,00 20,00
Calculated Value Name | Max. Deviation [%]
Superior Calorific Value 0,80
Inferior Calorific Value 1,00
Density 0,50
Relative Density 2,00
Wobbe Index 2,00
Compression Factor 2,00
100% Norm 5,00
Apply
Undo
Device SICV6F7B48@10.116.38.109 connected
Ready
CyclicRun
125 sec (150 sec)

2. Enter the parameters. Confirm the input using the **Enter key** on the PC keyboard. Click the "Apply" button when you have entered all values.

Description of parameters

- **Conc. in cycle [%] / RT in cycle [%]**

  These are the limits for the concentration and retention time relative to the setpoint.

- **CF in cycle [%] (deviation of calibration factor in the cycle)**

  Maximum permissible relative deviation of the calibration factors. Also refer to the significance of the parameters in the "Calibration Details" window in Section Results of the calibration (Page 48) and formula 6 of the GOST standard 31371.7-2008.

- **Conc. to prev. [%] / RT to prev. [%]**

  These are the limits for the concentration and retention time relative to the last calibration cycle.

- **Conc. to sealed [%] / RT to sealed [%]**

  These are the limits for the concentration and retention time relative to the first calibration cycle.

  – The first calibration cycle is the last calibration prior to the change to calibrated mode.

  – This monitoring is only effective in calibrated mode, during software locking.

- **Max. Deviation [%]**

  This is the total permissible deviation of the calorimetric values

  – Superior Calorific Value

  – Inferior Calorific Value

  – Density

  – Relative Density

  – Wobbe index

  – Compression Factor

  – 100 % standard

Note

Limits for alarm triggering

- The value 0% is unsuitable as a limit. An alarm is always triggered by this value.
- Enter the value 100% for the parameters for which no alarm is to be triggered.

Defining expectation ranges

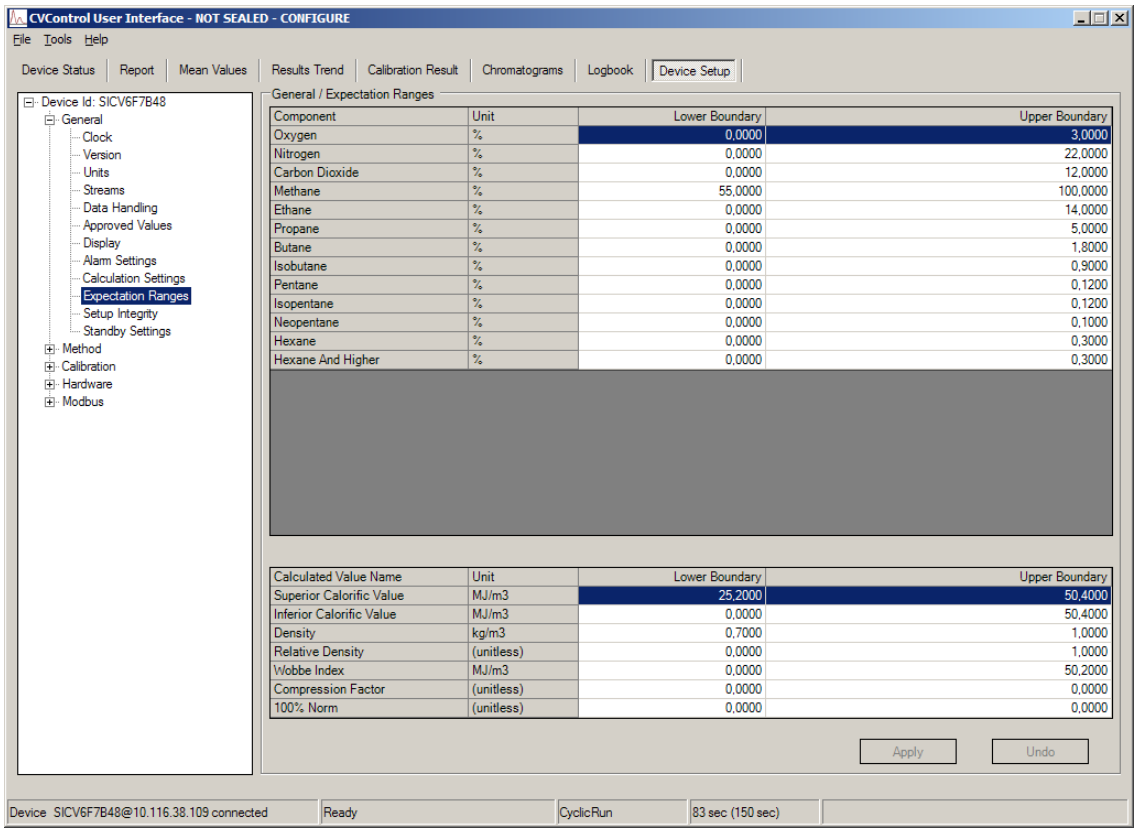
Note

Limits of expectation range

Certified mode: The upper and lower limits are defined by the PTB (Physikalisch-Technische Bundesanstalt), certified, and set when the device is delivered.

However, you can change the values within these limits according to your application.

1. In the navigation area, open the "General" group.
2. Click on the property object "Expectation Ranges".
3. Define the lower and upper limits for the gases and the calculated values.



The following units apply

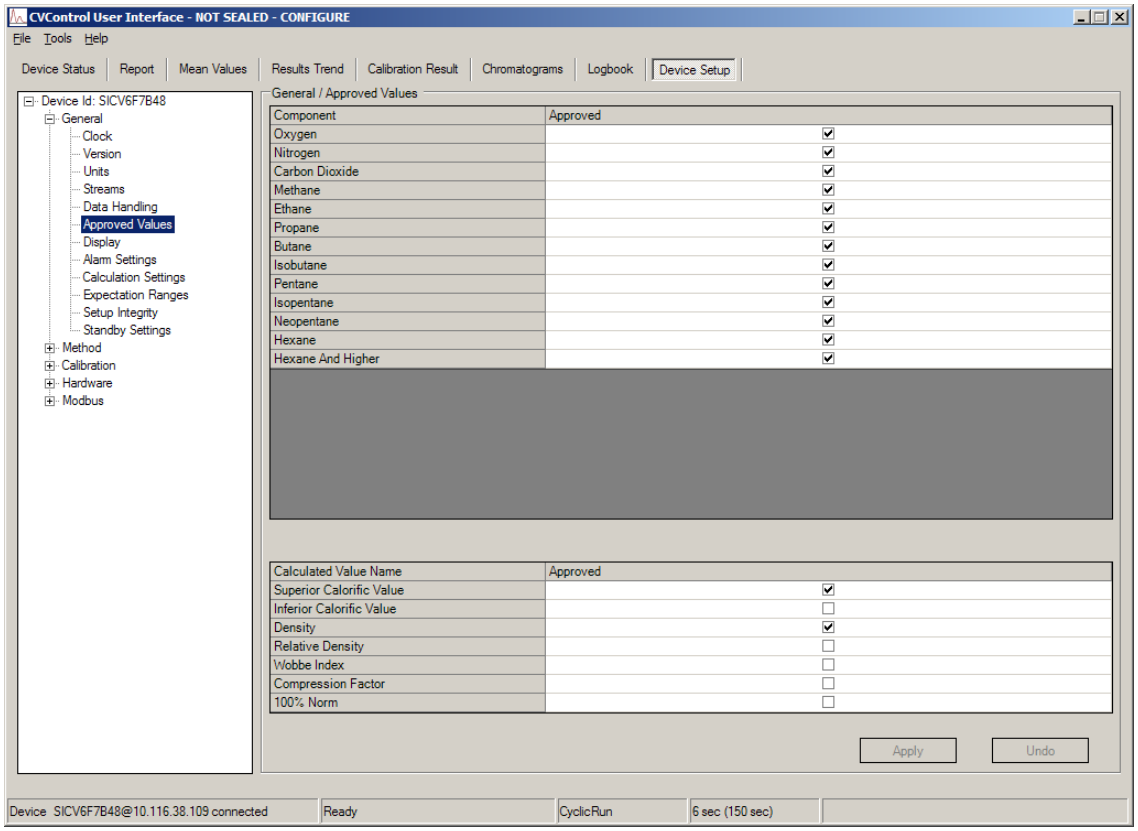
- Calorific values: MJ/m³, kWh/m³ and BTU/ft³
- Density: kg/m³ and lb/ft³
- Concentration: mol %
- Temperature: °C and °F

"Approved Values"

Measured values which are relevant to certification according to the directives of the country of use can be identified here as "Approved".
This identification appears in the report along with the selected measured value.
The measured values identified in this manner are also represented in the device display.

Proceed as follows to assign the identification:

1. In the navigation area, open the "General" group.
2. Click on the property object "Approved Value".
3. Mark the gases and calculated values to be checked by a tick in the dialog box "Approved".



Calculation standard

SITRANS CV automatically calculates calorific values in accordance with the following standards:

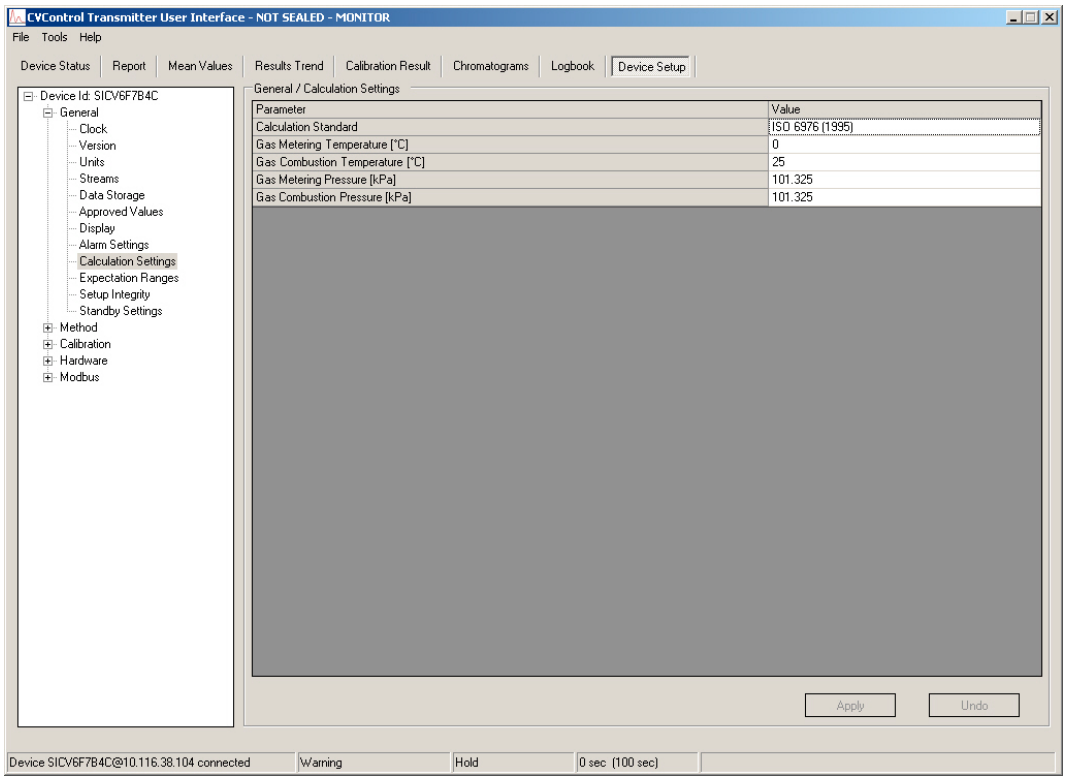
- ISO 6976 (1995)
- GOST 30319 (1996)
- AGA 8 (1994)

Note

AGA 8 also includes the standards GPA 2172 and ASTM 3588.
AGA 8 also includes ISO 12213 and API Chapter 14.2 for the Compression Factor .

The supplied product is set to ISO 6976. Conversion to other standards is carried out using country-specific setups.

Further information on the loading of country-specific setups can be found in Section "Installing the country-specific settings (Page 22).



Description of parameters

- **Gas Metering Temperature**

  Is a reference variable for calculating the calorimetric values, and is described in the standard. The range can be selected as 0, 15 or 20 °C.

- **Gas Combustion Temperature**

  Is a reference variable for calculating the calorimetric values, and is described in the standard. The range can be selected as 0, 15, 20 or 25 °C.

- **Calculation Method**

  Is set to the international standard ISO 6976: 1995(E).

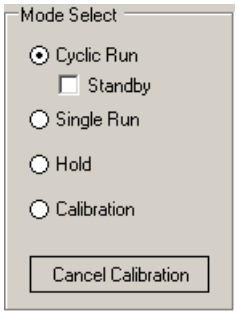
4.3 Start calibration cycle

4.3.1 Start calibration cycle manually

You can start a calibration cycle manually e.g. for the annual calibration by a calibration official. The chromatograph then calculates the calibration factor for every component.

Procedure

- In the window "CVControl" of the tab "Device Status", click in the "Mode Select" dialog box on "Calibration".



- The calibration cycle begins once the ongoing analysis has been completed, or immediately if the chromatograph was at "Hold".
- Following the calibration cycle, the chromatograph returns to the state it was in prior to the calibration.

4.3.2 Starting the calibration cycle with digital input

Procedure

Setting the digital input in the gas chromatograph starts the calibration procedure.

4.3.3 Starting the calibration cycle with Modbus

You can also start the calibration cycle with Modbus. The description for calibration can be found in Section: "Transmission of results over Modbus (Page 105) ".

4.3.4 Automatic tracking of calibration factors

The chromatograph starts a calibration cycle at a defined time of day at intervals of one or more days.

The calibration factors are corrected automatically in the process. The calibration cycle must be parameterized for this, and limits must be entered for the components.

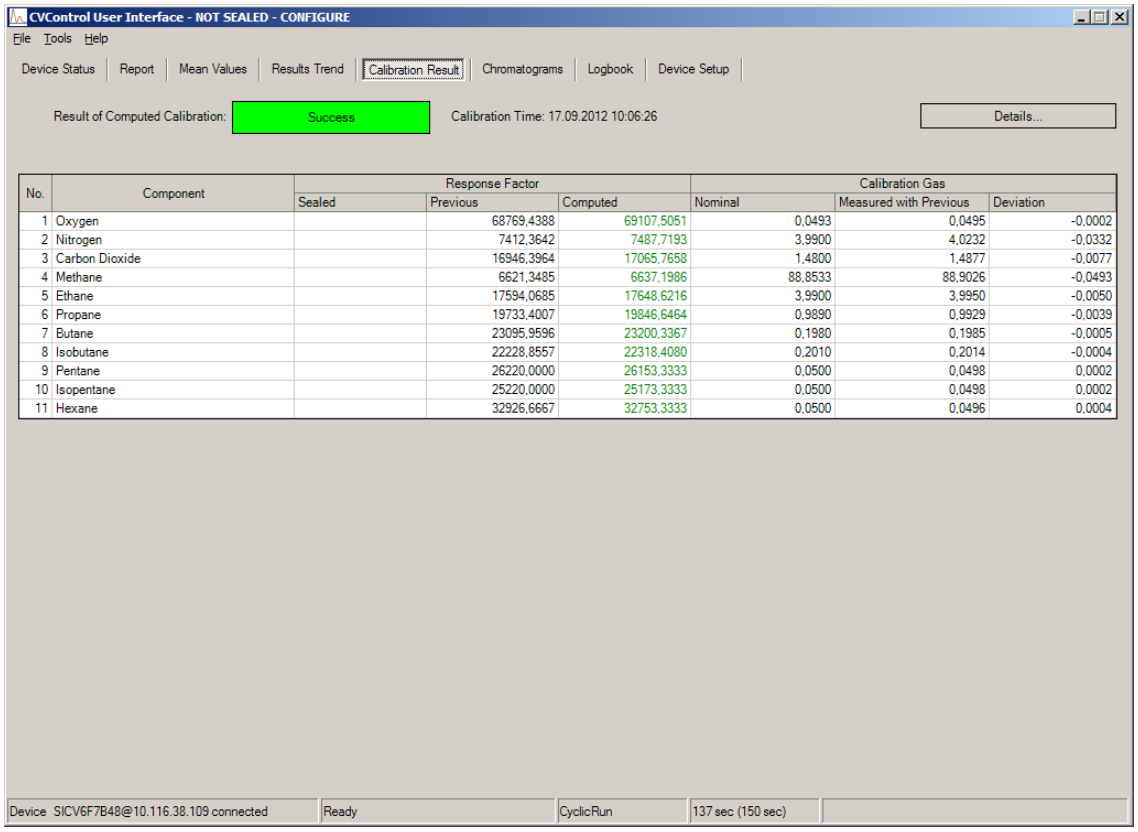
If the limits are violated, the chromatograph triggers an alarm and continues to use the previous calibration factors.

Note

Digital output in the gas chromatograph automatically switches on the calibration flow.

4.4 Results of the calibration

- You can view the response factors of all components for the current, previous and original calibrations in the window "Calibration Result".



No.	Component	Response Factor			Calibration Gas		
		Sealed	Previous	Computed	Nominal	Measured with Previous	Deviation
1	Oxygen		68769,4388	69107,5051	0,0493	0,0495	-0,0002
2	Nitrogen		7412,3642	7487,7193	3,9900	4,0232	-0,0332
3	Carbon Dioxide		16946,3964	17065,7658	1,4800	1,4877	-0,0077
4	Methane		6621,3485	6637,1986	88,8533	88,9026	-0,0493
5	Ethane		17594,0685	17648,6216	3,9900	3,9950	-0,0050
6	Propane		19733,4007	19846,6464	0,9890	0,9929	-0,0039
7	Butane		23095,9596	23200,3367	0,1980	0,1985	-0,0005
8	Isobutane		22228,8557	22318,4080	0,2010	0,2014	-0,0004
9	Pentane		26220,0000	26153,3333	0,0500	0,0498	0,0002
10	Isopentane		25220,0000	25173,3333	0,0500	0,0498	0,0002
11	Hexane		32926,6667	32753,3333	0,0500	0,0496	0,0004

- If the chromatograph is in calibrated mode, the deviations are shown as follows:
  - Green if the deviations are within the defined limits
  - Red if the deviations exceed the limits
- If limits have been exceeded, you can click the "Details" button to change to the window "Calibration Details" in order to obtain more detailed information.

Note

The "Details" list is deleted as soon as you change from "Configure mode" to calibrated mode.

Meaning of parameters in the window "Calibration Result"

- **Computed RF**

  These are the calculated response factors of the current calibration.

- **Previous RF**

  These are the calculated response factors of the previous calibration.

- **Sealed RF**

  These are the response factors of the calibration following which a change was made to calibrated mode.

- **Nominal Concentration**

  These are the concentrations of the calibration sample entered in the window "Device Setup ➜ Calibration ➜ Calibration Gas and Calculated Values".

- **Actual Concentration**

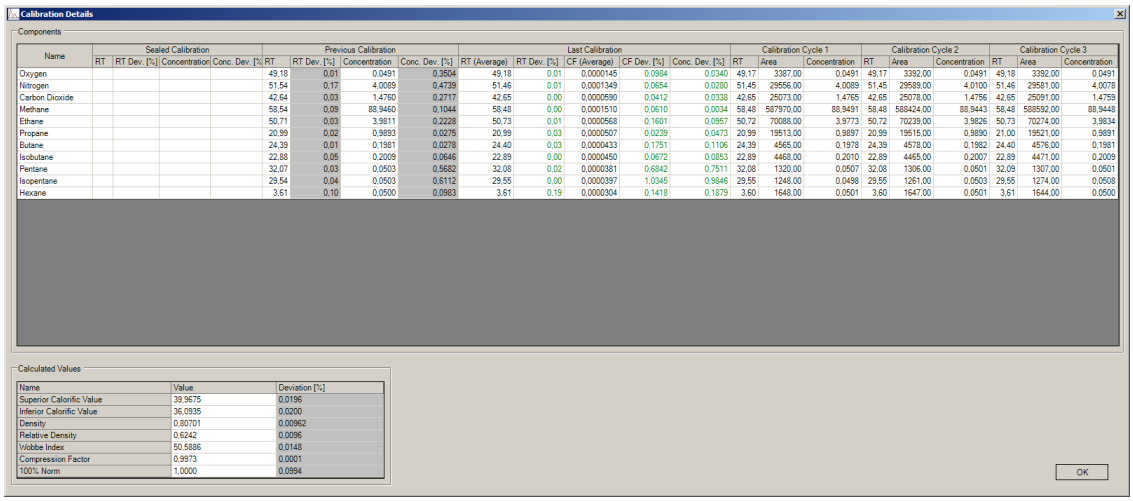
  These are the concentrations resulting with the response factors of the previous calibration.

- **Deviation**

  This is the deviation of the "Actual Concentration" from the "Nominal Concentration".

Meaning of parameters in the window "Calibration Details"

You can view the following parameters for the current, previous and original calibrations:



- **Retention time (RT)**

  is the time required by the components in the sample stream to pass through the column.

- **Deviation of retention time (RT Dev. [%])**

  This is the deviation of the retention times of this calibration referred to the retention times entered in the window "Device Setup ➜ Method ➜ Named Peaks".

- **Concentration**

  These are the concentrations resulting with the response factors of the previous calibration in each case.

- **Deviation of concentration (Conc. Dev [%])**

  This is the deviation of the concentrations of the respective calibration referred to the concentrations entered in the window "Device Setup ➜ Calibration ➜ Calibration Gas and Calculated Values".

- **Average calibration factor (CF (Average))**

  Average calibration factor of the measured component during the calibration cycles. See also formula 5 of the GOST standard 31371.7-2008

- **Deviation of calibration factor (CF Dev. [%])**

  This is the relative deviation of the calibration factors of the individual analyses of a calibration referred to the mean calibration factor. See also formula 4 of the GOST standard 31371.7-2008

- **Calculated values**

  This box displays the current calculated values and their deviation from the values displayed in the window "Device Setup ➜ Calibration ➜ Calibration Gas and Calculated Values".

See also

Calculation formulae (Page 102)

Optimization of method 5

The automatic optimization of method increases the availability and repeatability of the analysis. The gas chromatograph optimizes the column switching commands and integration parameters depending on the current retention times. Optimization is carried out without time loss for the first two analyses of the calibration sequence which are normally rejected. This improves the repeatability of the calorific value measurement, and the aging process is compensated.

Note

Cancellation of certification

The optimization of method is part of the country-specific settings, and is usually activated.

Certified mode: The settings of the automatic optimization of method must not be changed, otherwise the certification is canceled.

Note

Optimization Error

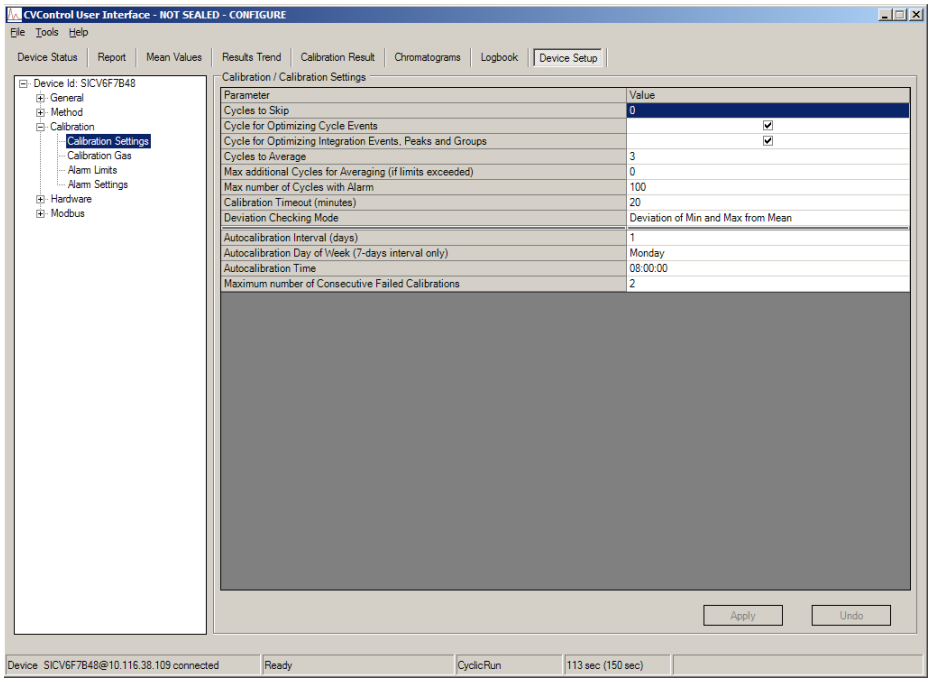
The chromatograph signals an "Optimization Error" if not all peaks are detected which are referenced for the optimization.

5.1 Switching the automatic optimization of method on and off

The automatic optimization of method can be activated for "Cycle Events" and "Integration Events".

The parameters "Optimize CycleEvents" and "Optimize IntegrationEvents, Peaks & Groups" are available for activation in the tab "Device Setup ➜ Calibration ➜ Calibration Settings".

1. By activating the checkboxes "Cycle for Optimizing Cycle Events" and "Cycle for Optimizing Cycle IntegrationEvents, Peaks & Groups" you can switch the optimization on or off.
2. Finally click the "Apply" button.

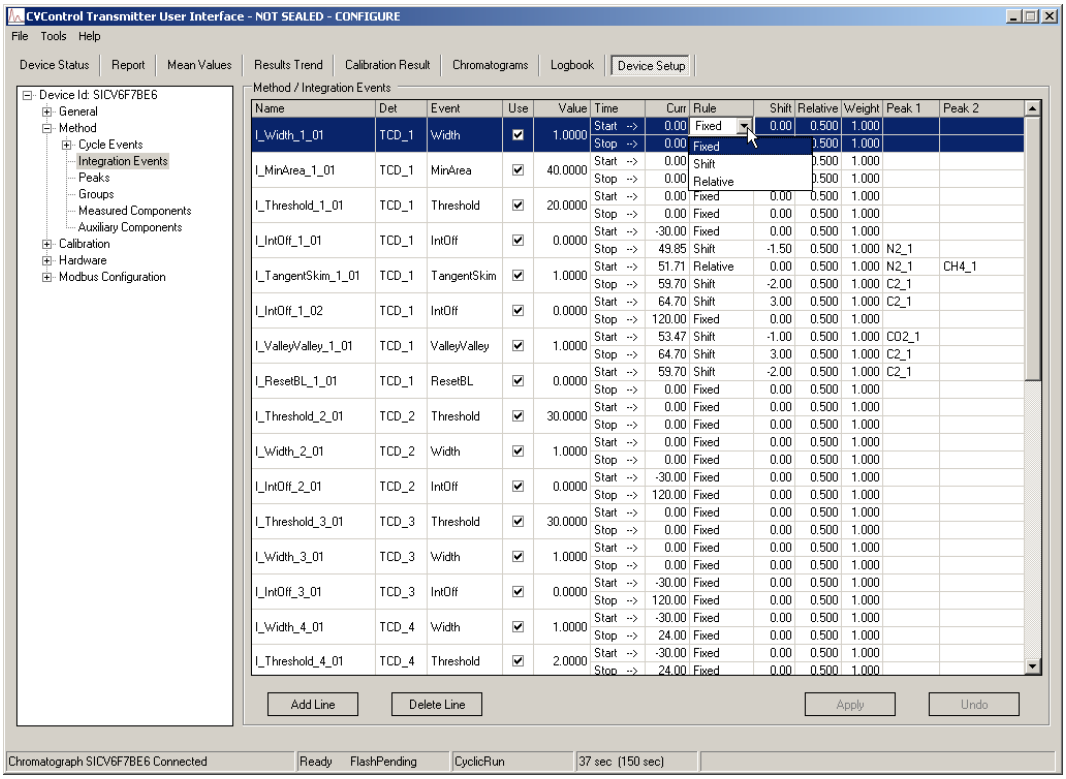


5.2 Parameterization of events

In the navigation area "Method" of the tab "Device Setup", the optimization parameters are included for every line in the property objects "Peaks", "Integration Events" and "Cycle Events". The associated parameters can be found in the columns:

- "Rule"
- "Shift"
- "Relative"
- "Weight"
- "Peak 1"
- "Peak 2"

All components or events to be optimized must be parameterized in these lists.



Select optimization procedure

There are three optimization procedures "Fixed", "Shift" and "Relative". In addition, generation of a mean value is possible between the existing and new values ("Weight").

- "Fixed" directly uses the retention time entered under "Current".
- "Shift" adds the entered value in seconds to the retention time of the peak specified under "Peak 1".
- "Relative" specifies the position between two reference peaks (Peak 1 and Peak 2). The value 0.5, for example, means that the time average is between the two peaks.
- "Weight" is a weighting factor for corrections. The mean value is generated between the previous and new retention times.
  Example: With a value of 1.0, the new retention time is applied directly. With a value of 0.5, the new retention time has a 50% effect.

5.3 Peaks and peak list

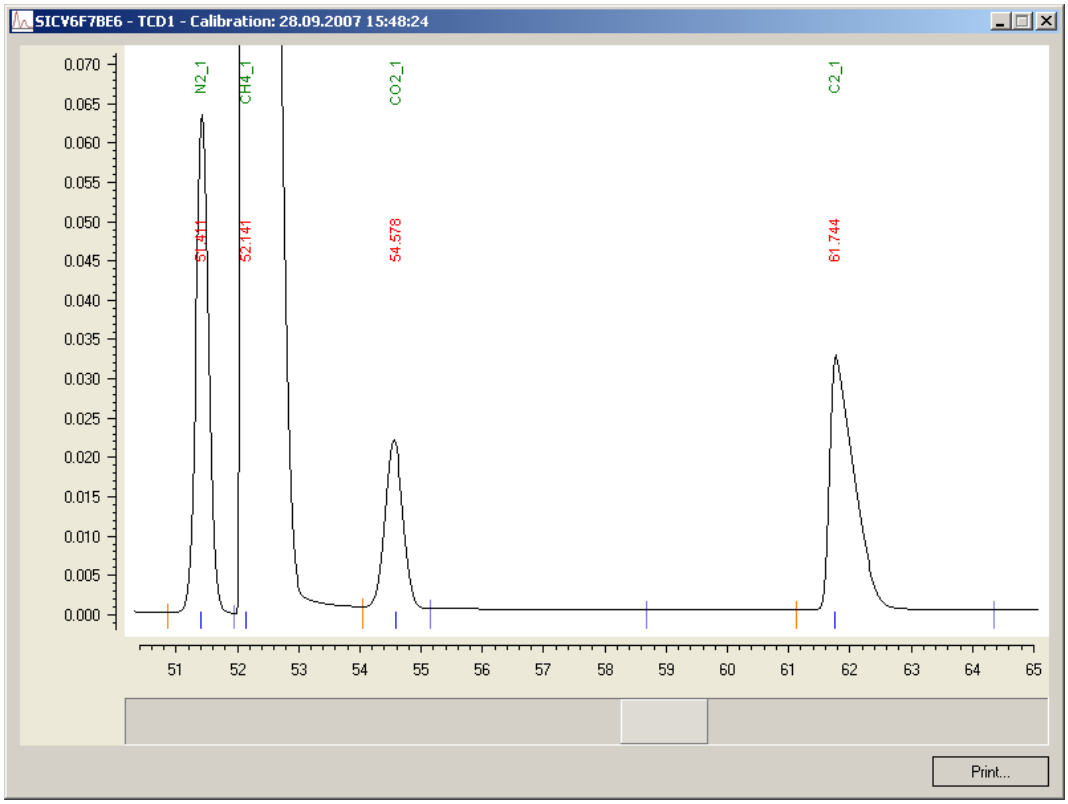
- All peaks of the peak list must be identified correctly.

Note

- The name of the peak and the retention time must appear on the chromatogram.
- The x-axis shows the retention time, and the y-axis the signal strength.
- The following example refers to the analysis module C09.
- Detector 3 is not activated for the analysis module C09.

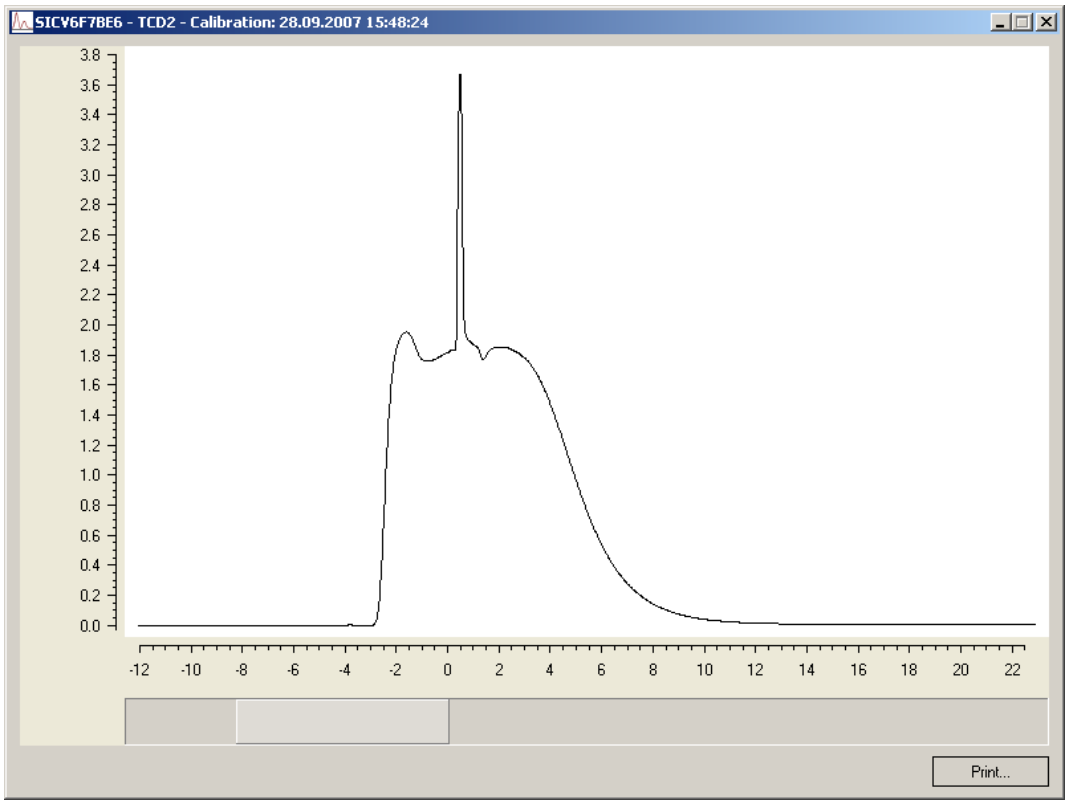
Detector 1

Measurement and display of the name and retention time of the peak(s).



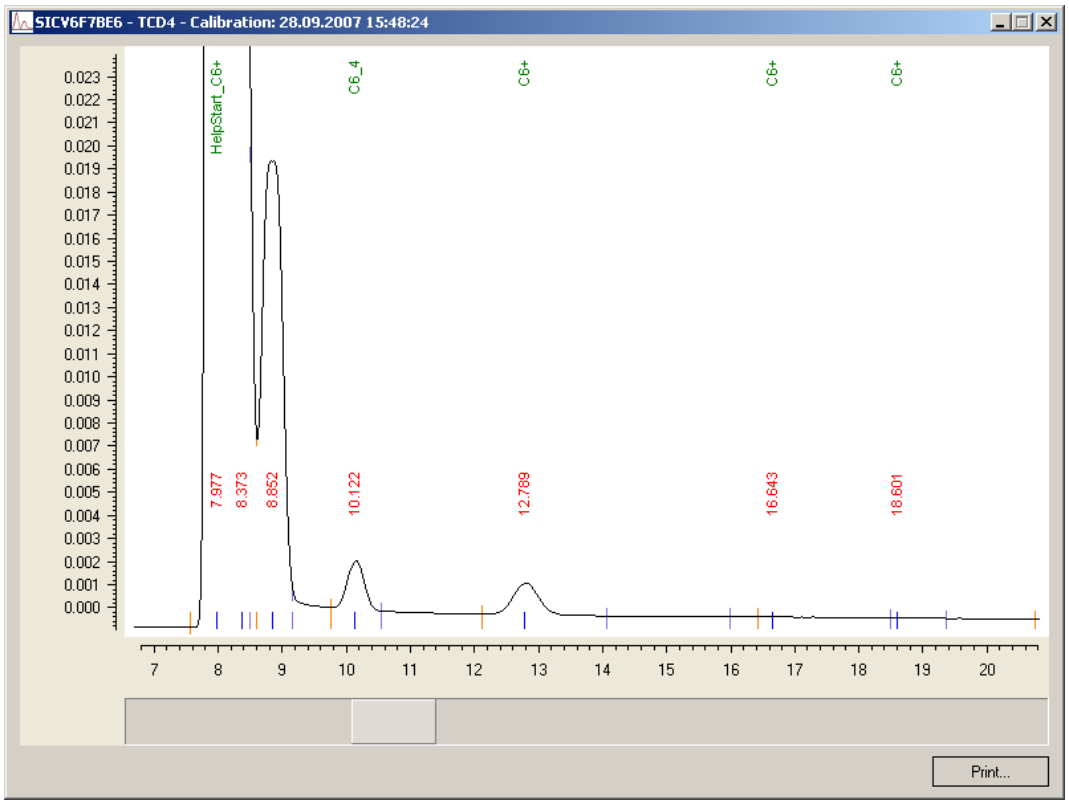
Detector 2

Display of "Dossier peak" without measurement



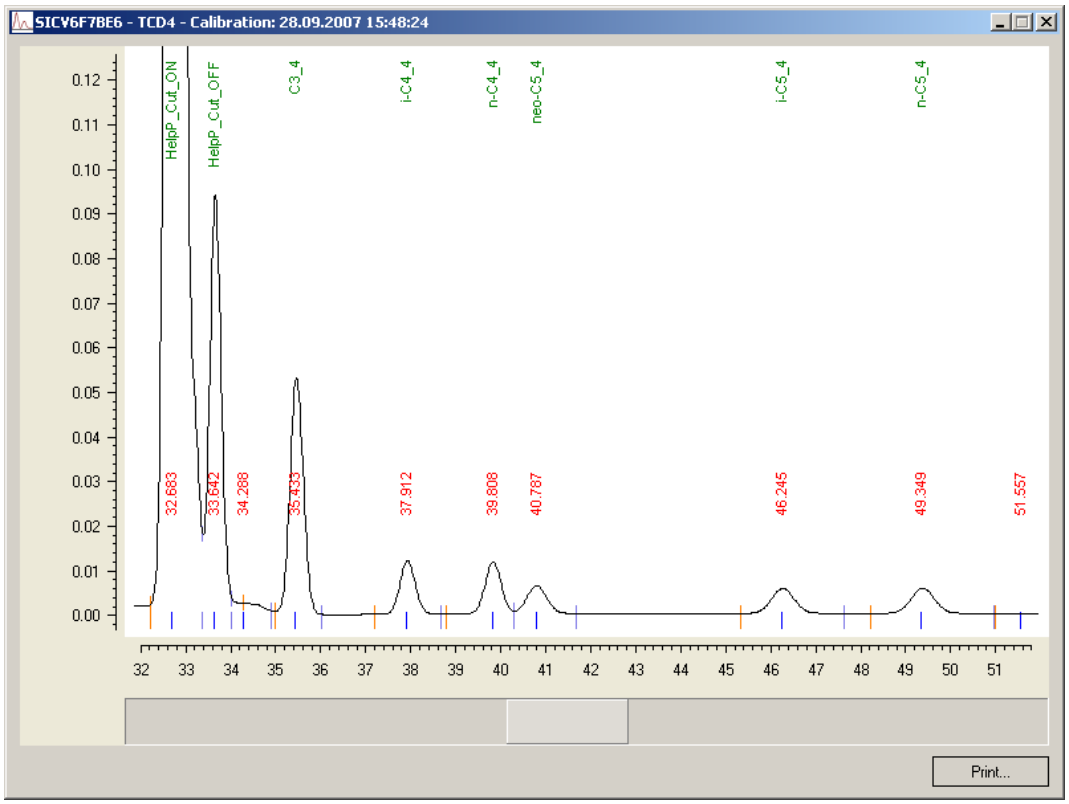
Detector 4

Continuation of measurement and display of the name and retention time of the peak(s).



Detector 4

Continuation of measurement and display of the name and retention time of the peak(s).



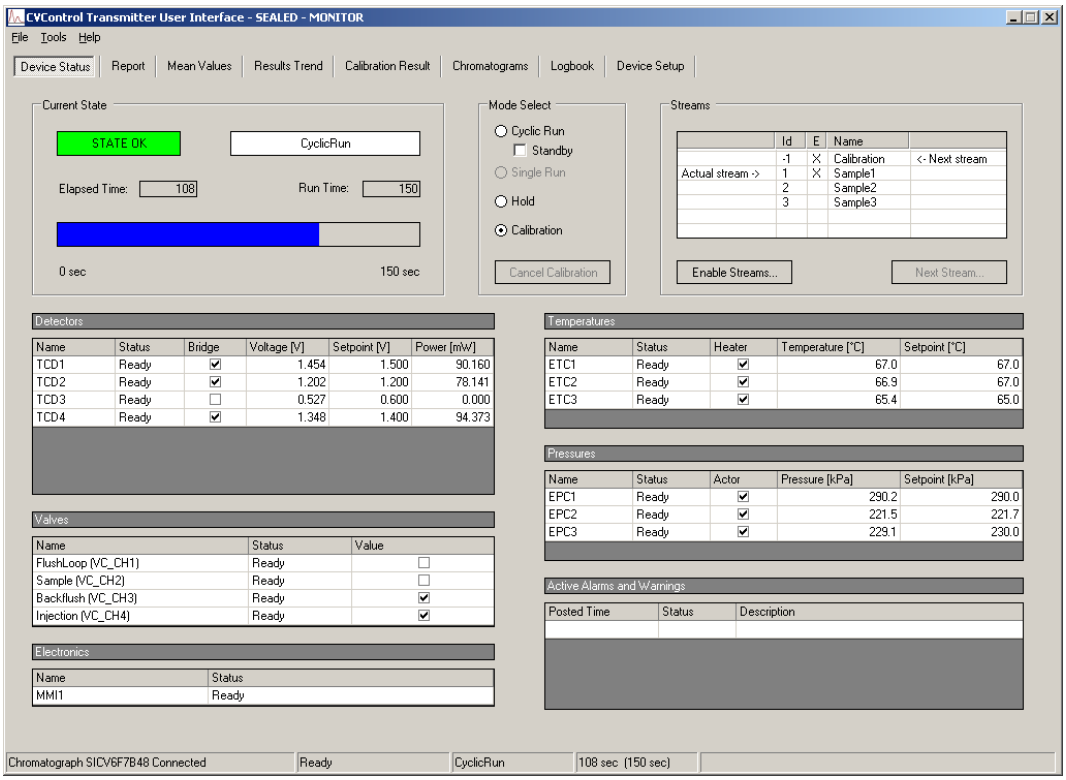
Status

6

The chromatograph monitors all actions which can cause faults, and displays the current state in the tab "Device Status". The device generates a group message from all signals, and displays this in the tab "Device Status" under "Current State". You can define in the tab "Device Setup" whether a fault will trigger an alarm, a warning or nothing.

Ready

If the device status is OK, the chromatograph displays the message "STATE OK" on a green background in the tab "Device Status" under "Current State". At the same time, the green LED "Ready" lights up behind the window of the gas chromatograph.



Alarm

Note

If an alarm occurs during an analysis, the measured values are set to a value of 0. This analysis is not included in generation of the mean value.

If an alarm occurs, the chromatograph has a serious fault.

Example: The carrier gas pressure is too low. The results can no longer be trusted. The chromatograph does not start a new analysis.

An alarm is shown in red by the chromatograph in the tab "Device Status" and by the red LED "Failure" behind the window.

Warning

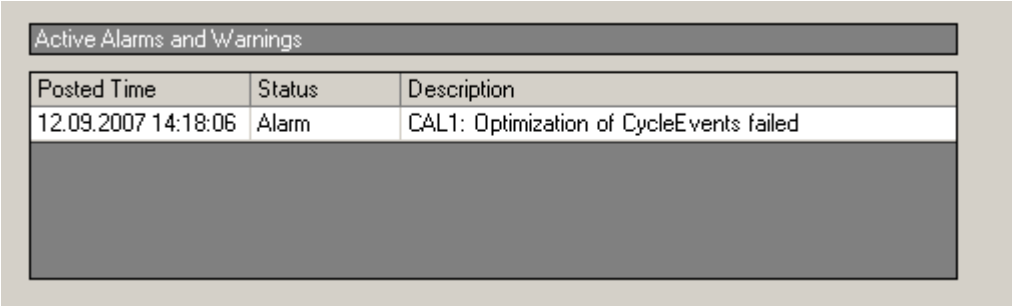
The chromatograph has detected a fault. However, the results can still be trusted.

Warnings are shown in yellow by the chromatograph in the tab "Device Status" and by the yellow LED "Maintenance Request" behind the window. They do not have an effect on "Ready", and do not stop cyclic operation.

6.1 Status messages and logbook

Fault message

- Current faults are displayed by the gas chromatograph in the tab "Device Status" under "Current State" by the message "ALARM" on a red background.
- The fault description is present in the box "Active Alarms and Warnings".
- The status message or fault message is saved in the logbook.



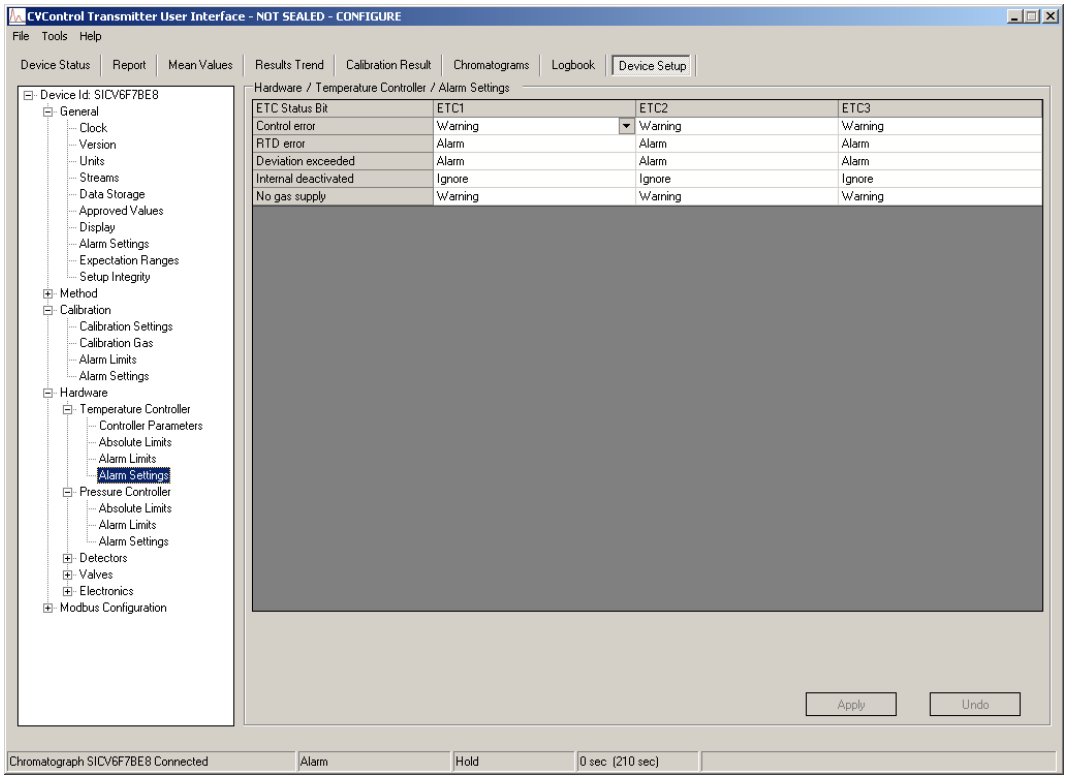
Note

- Once the cause of the alarm has been eliminated, the corresponding message is deleted from the box "Active Alarms and Warnings".
- However, all status messages remain saved in the logbook, even if the cause of the alarm has been eliminated. See also Section Logbook (Page 73).

6.2 Assignment of status signals

Procedure explained using an example:

1. In the window "CVControl" of the tab "Device Setup", first click on the left in the navigation area on "Hardware" and then e.g. on "Temperature Controller" and "Alarm Settings".



2. Click in the box you wish to change, and select "Alarm", "Warning" or "Ignore".
3. Click "Apply" to confirm. A fault in the associated parameter then either triggers an alarm, a warning, or nothing at all.

6.3 Monitored parameters

Note

The analysis and the results can no longer be trusted if there are faults in the parameters.

The following device parameters are monitored during operation:

- Temperature controllers 1 to 3 Ready/Alarm
- Pressure controllers 1 to 3 Ready/Alarm
- Detectors 1 to 4 Ready/Alarm
- Electronics with signal processing, watchdog and communication
- Gas supply
- Expectation ranges
- Checksum during calibrated mode
- Monitoring of sample flow
- Method
- Modbus
- Gas supply
- Expectation ranges
- Calibration
- Standardization factor.

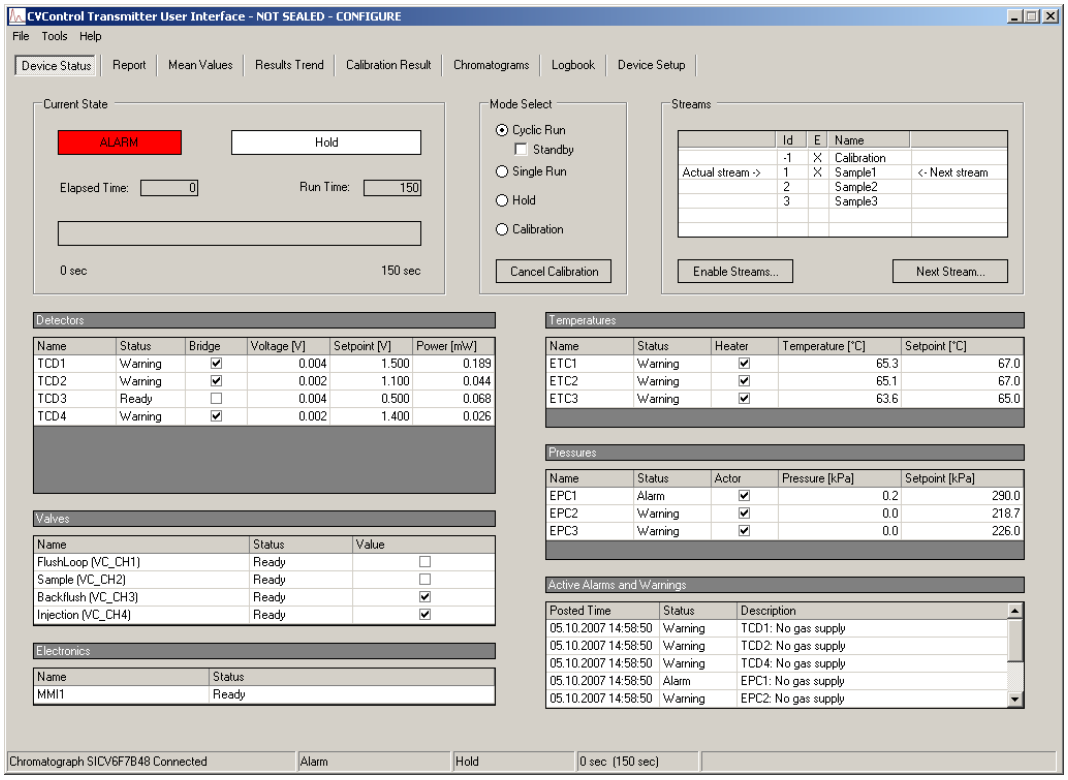
See also

Calibrating (Page 33)

6.4 Gas supply

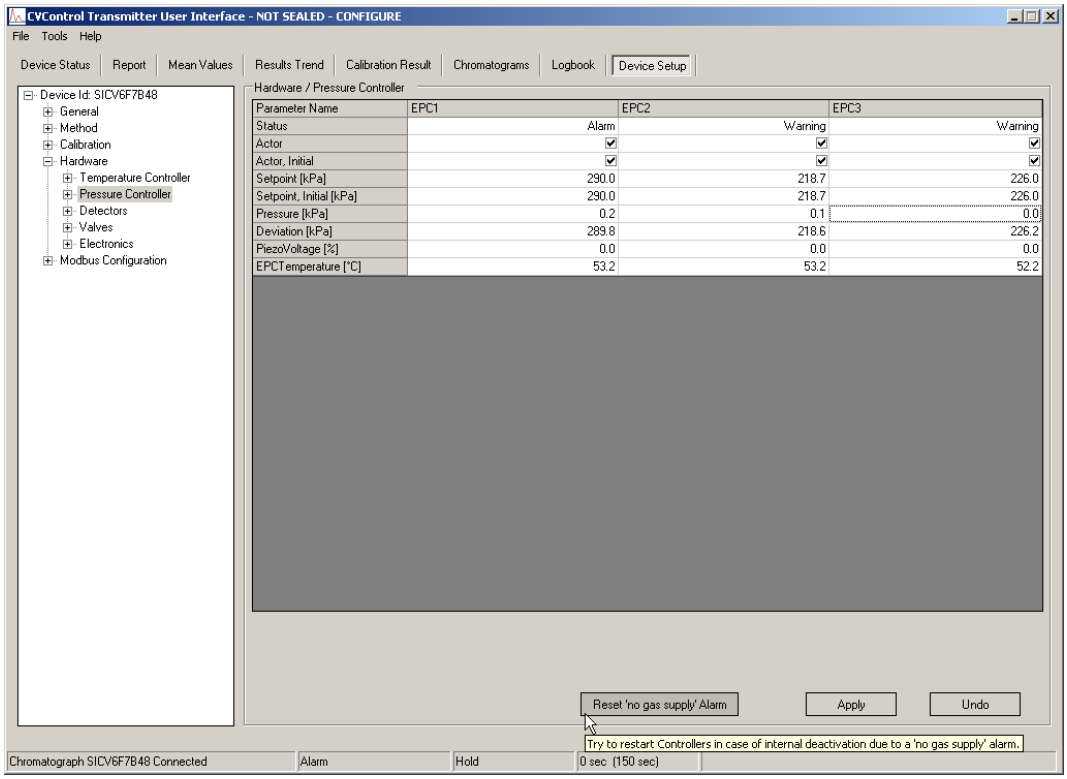
Function

- The gas chromatograph monitors the carrier gas pressure.
- If the carrier gas fails, the gas chromatograph switches off all heaters and detector power supplies. The status display "ALARM" is then output in the CVControl operating software.

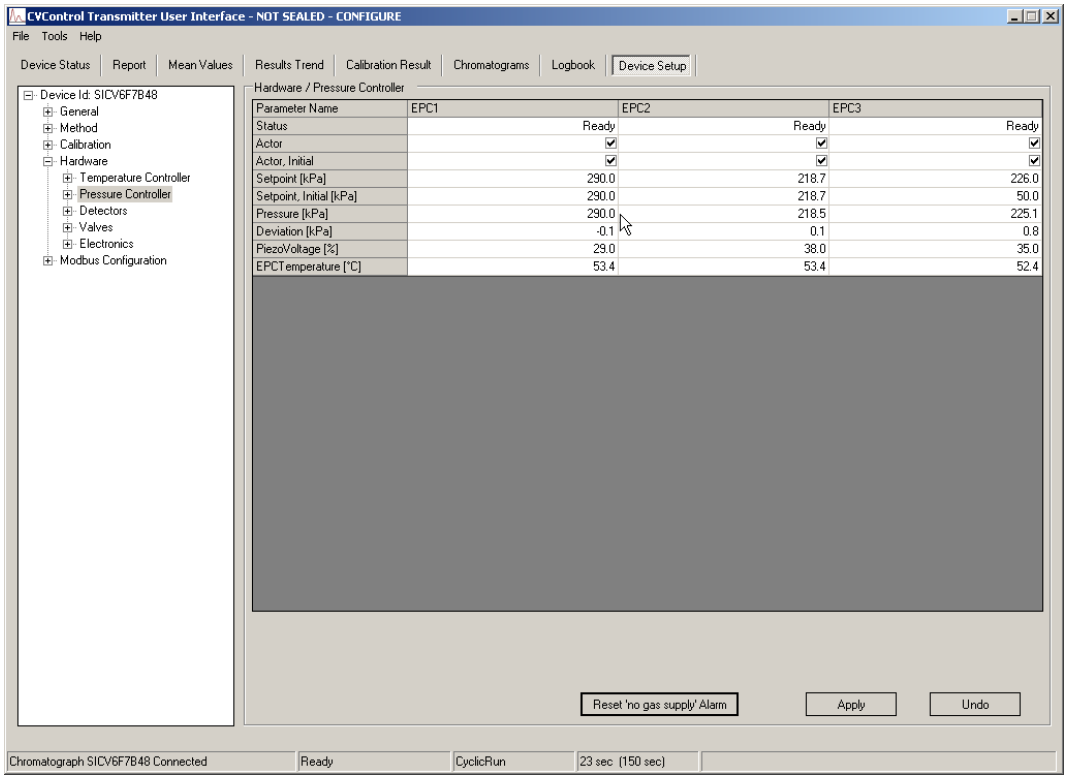


- If the carrier gas supply is reestablished, the chromatograph is **not** automatically restarted.
- A manual restart is necessary in this case.

- Open:
  - the tab "Device Setup",
  - the group "Hardware" in the navigation area,
  - the property object "Pressure Controller", and click on the button "Reset 'no gas supply' Alarm".



- The device is ready for operation again if the value "Pressure" is equal to the value "Setpoint" and if "Ready" is displayed in the "Status" line.



6.5 Sample flow monitoring

Note

The following description for setting the sample flow monitoring function is only to provide users with a better understanding.

The sample flow of e.g. 20 ml/min is monitored permanently. It is interrupted once in each analysis cycle by the injection process. The sample flow alarm is present at digital input 1 (+24 V DC).

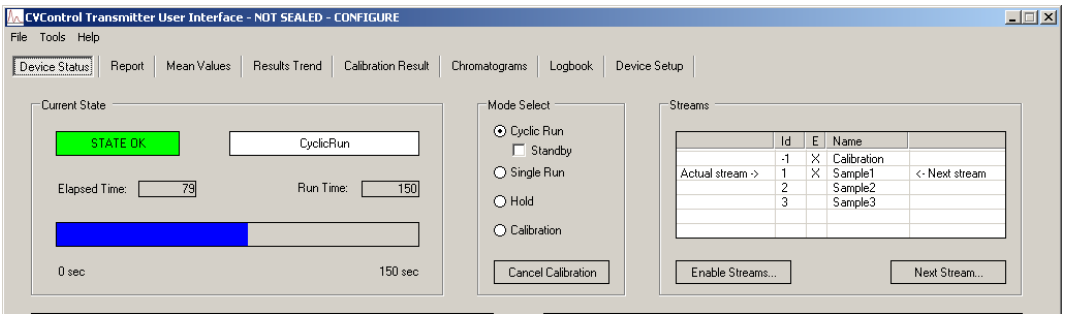
Requirements

1. The sample preparation must have a sample flow monitoring function.
2. The device and the "CVControl" operating software have been started.

Procedure

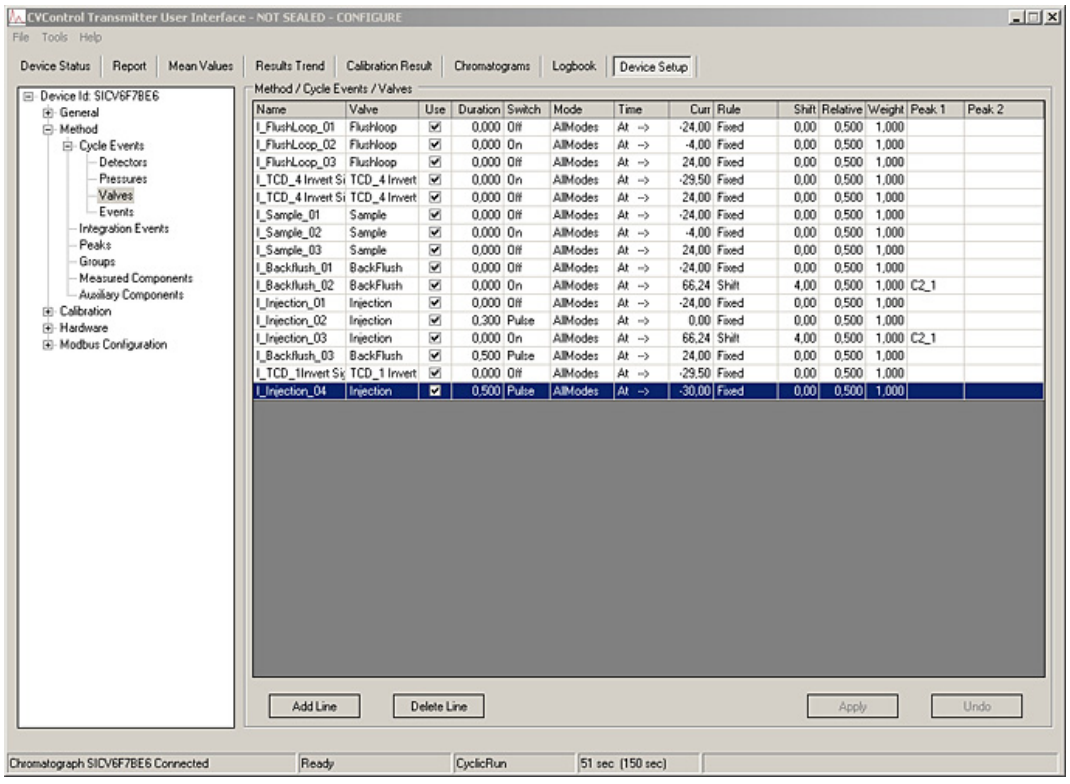
1. Select "CONFIGURE" in the drop-down list in the "CVControl" program, and confirm with "OK".

   The "CVControl Transmitter User Interface" window is displayed.



2. Select the "Device Setup" tab.
   Open the groups "Method" and "Cycle Events" in the navigation area.

   Click on the property object "Valves".



3. **Read sample flow interruption:**

   Read the value "Current time" in lines "I_Sample_02" and "I_Sample_03".

   Example:

   Switching on: " Line I_Sample_02" = - 4 s

   Switching off:" Line I_Sample_03" = 24 s

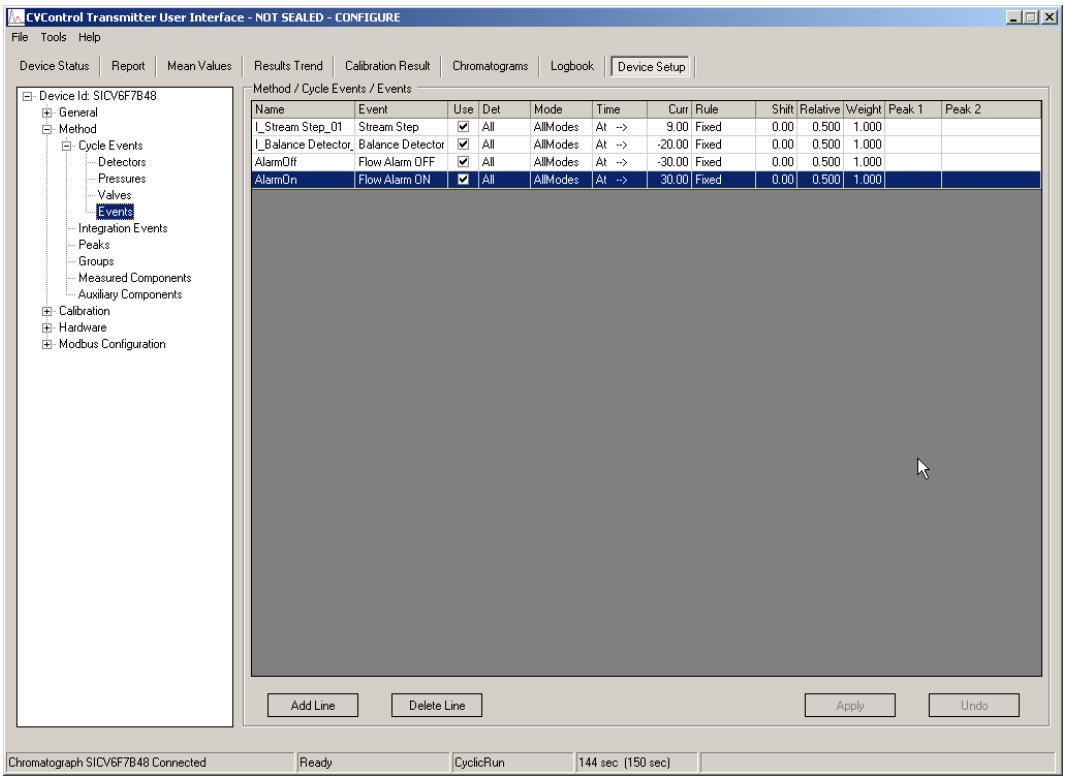
   Result:

   – The minimum interval (absolute value) for alarm suppression is 28 seconds.
   – This interval of 28 seconds defines the **minimum value**.
   – This value can be increased by the user in "Events".

4. Define time interval in "Events".

   Open the group "Method" and "Cycle Events" in the navigation area.

   Click on the property object "Events".



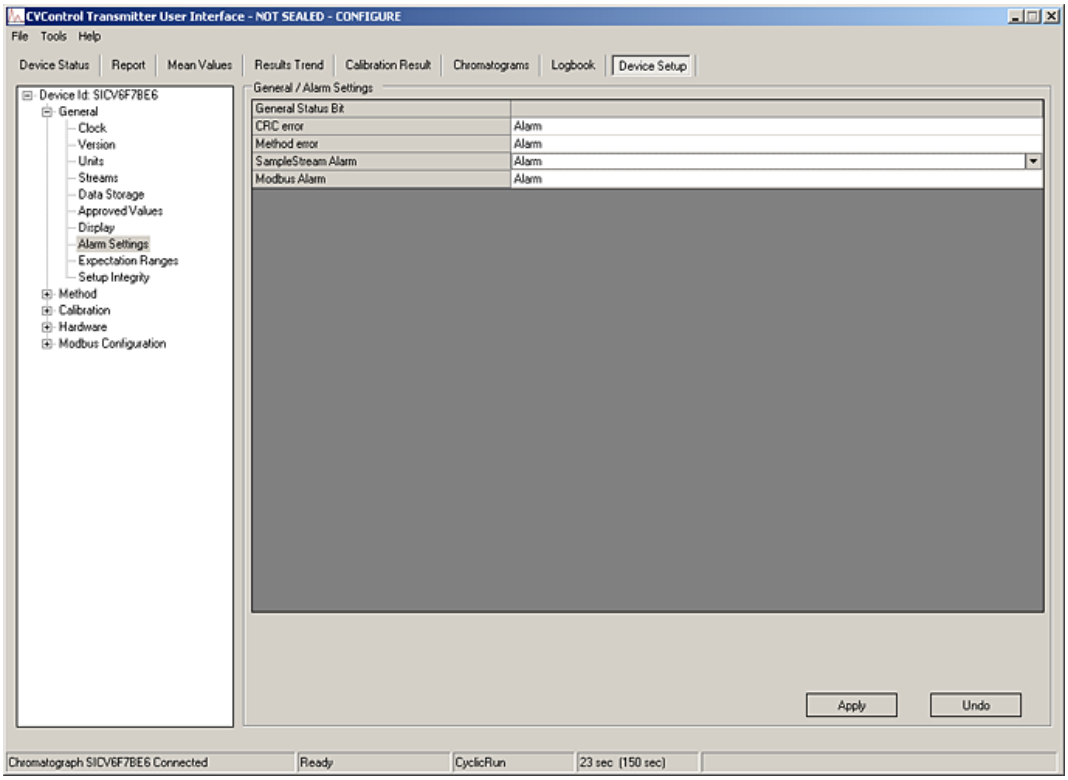
Example:

Change "Follow Alarm Off" to -30 s

Change "Follow Alarm On" to +30 s

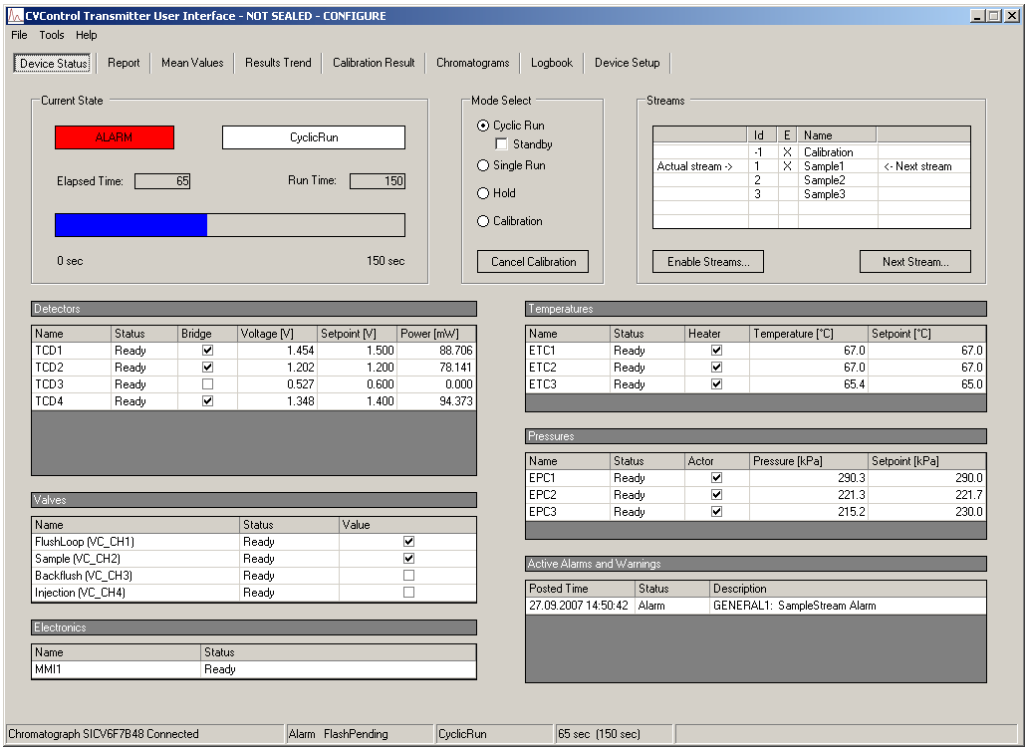
Result: A time interval of 60 seconds is set and can be used.

5. Activate alarm.
   - In the navigation area, open the "General" group.
   - Click on the property object "Alarm Settings".
   - Select the line "SampleStream Alarm" in the list "General / Alarm Settings".
   - Select "Alarm" in the drop-down list.

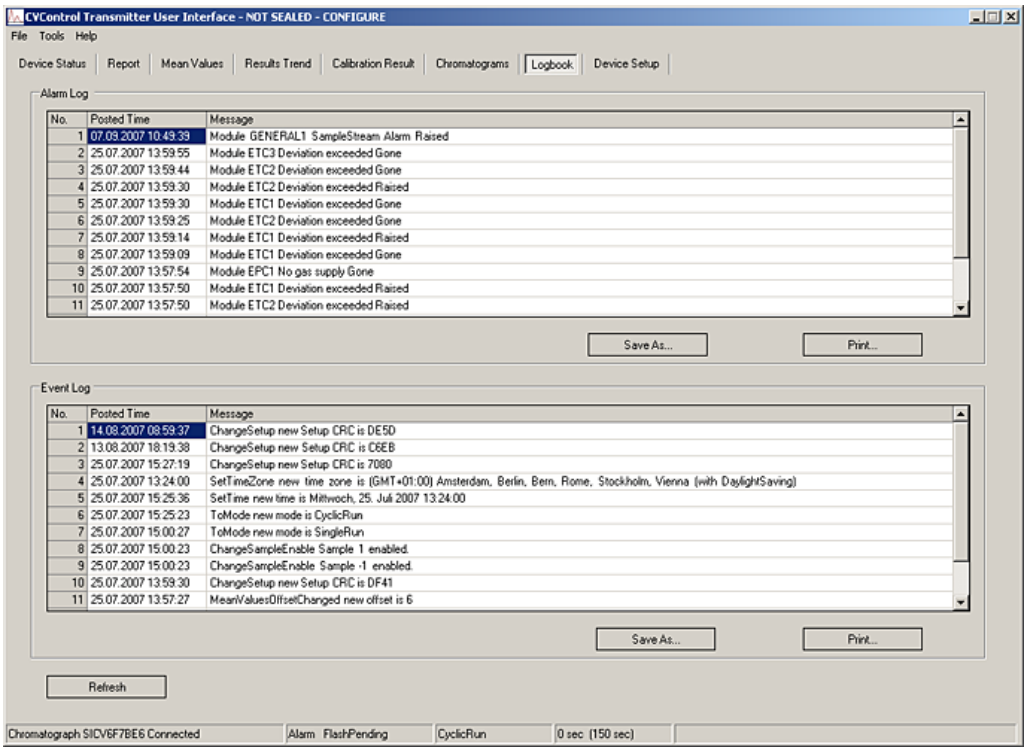


Effect

1. A red box with the wording "ALARM" is displayed in the tag menu "Device Status" if no sample flow or an insufficient flow is present.



The entry "Sample Stream Alarm" is then made in the logbook.


CVControl Transmitter User Interface - NOT SEALED - CONFIGURE
File Tools Help
Device Status Report Mean Values Results Trend Calibration Result Chromatograms Logbook Device Setup
Alarm Log
No. Posted Time Message
1 07.09.2007 10:49:39 Module GENERAL1 SampleStream Alarm Raised
2 25.07.2007 13:59:55 Module ETC3 Deviation exceeded Gone
3 25.07.2007 13:59:44 Module ETC2 Deviation exceeded Gone
4 25.07.2007 13:59:30 Module ETC2 Deviation exceeded Raised
5 25.07.2007 13:59:30 Module ETC1 Deviation exceeded Gone
6 25.07.2007 13:59:25 Module ETC2 Deviation exceeded Gone
7 25.07.2007 13:59:14 Module ETC1 Deviation exceeded Raised
8 25.07.2007 13:59:09 Module ETC1 Deviation exceeded Gone
9 25.07.2007 13:57:54 Module EPC1 No gas supply Gone
10 25.07.2007 13:57:50 Module ETC1 Deviation exceeded Raised
11 25.07.2007 13:57:50 Module ETC2 Deviation exceeded Raised
Save As... Print...
Event Log
No. Posted Time Message
1 14.08.2007 08:59:37 ChangeSetup new Setup CRC is DE5D
2 13.08.2007 18:19:38 ChangeSetup new Setup CRC is C6EB
3 25.07.2007 15:27:19 ChangeSetup new Setup CRC is 7080
4 25.07.2007 13:24:00 SetTimeZone new time zone is (GMT+01:00) Amsterdam, Berlin, Bern, Rome, Stockholm, Vienna (with DaylightSaving)
5 25.07.2007 15:25:36 SetTime new time is Mittwoch, 25. Juli 2007 13:24:00
6 25.07.2007 15:25:23 ToMode new mode is CyclicRun
7 25.07.2007 15:00:27 ToMode new mode is SingleRun
8 25.07.2007 15:00:23 ChangeSampleEnable Sample 1 enabled.
9 25.07.2007 15:00:23 ChangeSampleEnable Sample -1 enabled.
10 25.07.2007 13:59:30 ChangeSetup new Setup CRC is DF41
11 25.07.2007 13:57:27 MeanValuesOffsetChanged new offset is 6
Save As... Print...
Refresh
Chromatograph SICV6F7BE6 Connected
Alarm FlashPending
CyclicRun
0 sec (150 sec)

2. The analysis is invalid, i.e.:
   - All concentrations are set to zero.
   - This analysis is not included in generation of the mean value.

Note

Alarm remains present?

If the alarm remains present, the device stops, and no new analyses can be started.

Remedy:

- Eliminate the source of the error or the cause of the alarm. Following elimination of the causes, the device continues working **without a restart**.

Logbook

7

The chromatograph automatically saves all faults and events in a chronological list. To provide a better overview, it lists faults and manual interventions separately:

- The "Alarm Log" list records all alarms. Warnings are not recorded.

  Examples: deviations of temperature or pressure controllers.

- The "Event Log" lists manual interventions.

  Examples: changes in the factory settings, switching on, switching off, change to calibrated mode.

Note

Synchronization of logbook

Using the "Refresh" button you can synchronize the contents of the logbook on the PC with the gas chromatogram.

Printing of logbook

If a printer is connected to the PC, you can print out the logbook.

Click the "Print" button in the "Logbook" tab in the "Alarm Log" or "Event Log" area. The Windows print dialog is displayed.

Saving of logbook on hard disk

1. Click the "Save As" button in the "Logbook" tab in the "Alarm Log" or "Event Log" area.
2. Select the directory and file name.
   - The logbook entries are saved as a .csv file.
   - If you specify .txt as the file name extension, the logbook is saved as a text file.

Analysis control and operating modes

8

8.1 Overview

The selected operating mode determines whether the gas chromatograph carries out one or more analyses.

The gas chromatograph has the following operating modes:

- Single analysis
- Cyclic analyses
- Calibrating
- Standby

8.2 Starting an analysis

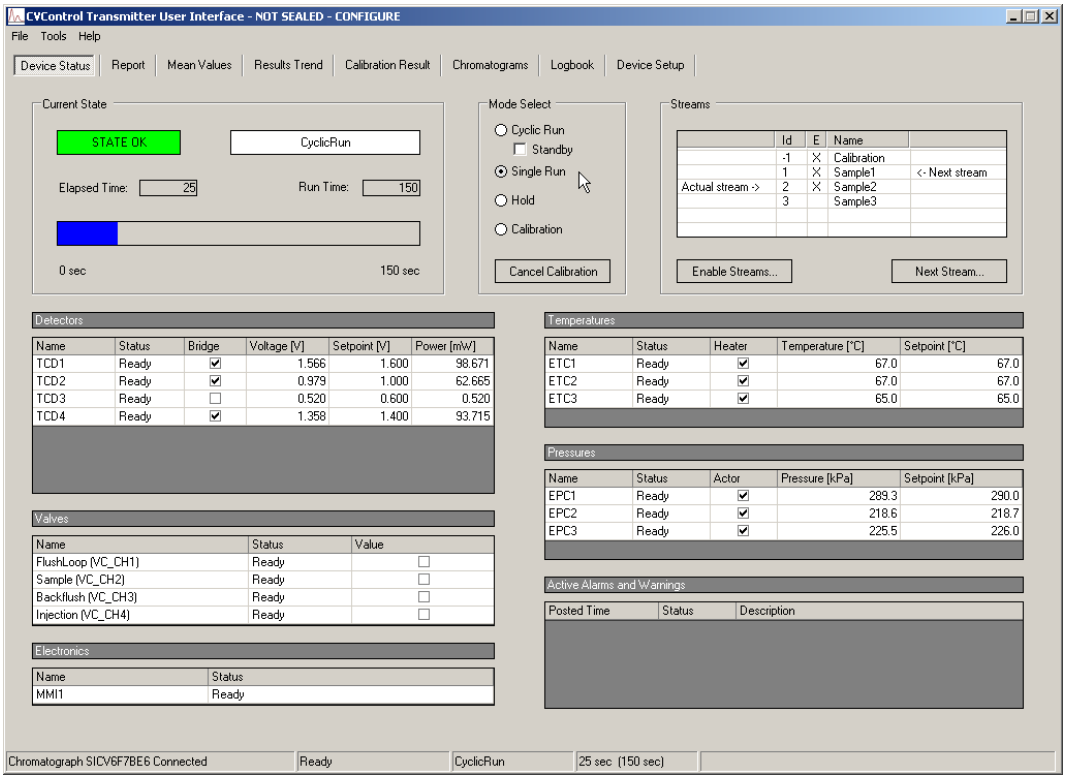
Before starting

Prior to the analysis, the initial state for it must be established.

Wait until the chromatograph signals "Ready".

If you start the analysis while the chromatograph is still in the "Not Ready" state, the chromatograph will only start the analysis when the "Ready" state has been reached.

Start single analysis (Single Run)



Note

- In operating mode "Single Run", the command "Stream Step" (changing of sample stream) is ineffective.
- You must switch on the desired sample stream manually.
- In operating mode "Single Run", you must manually start each analysis individually.

Proceed as follows:

1. Check whether the desired sample stream is selected.
2. Click the option box "Single Run" in the dialog box "Device Status" of the option box "Mode Select".
   - The chromatograph starts an analysis.
   - After the analysis, the chromatograph switches to the "Hold" state.

Start cyclic analysis (Cyclic Run)

Click the option box "Cyclic Run" in the dialog box "Device Status" of the option box "Mode Select".

In operating mode "Cyclic Run", the gas chromatograph executes the sample stream sequence list cyclically. Once the analysis has been finished, the analysis clock is reset to zero, and the gas chromatograph automatically starts the next analysis.

Note

Power failure

If a power failure occurs in "Cyclic Run" mode, the gas chromatograph restarts automatically. "Cyclic Run" is continued following a calibration cycle.

8.3 Stopping the analysis

Note

It is not possible to immediately stop an ongoing analysis by means of an operator input.

Click the option box "Hold" in the dialog box "Device Status" of the option box "Mode Select".

- The chromatograph continues up to the end of the current analysis.
- The chromatograph then switches to the "Hold" state.

8.4 Analysis clock

The chromatograph controls the analyses using device-internal timebase.

Analysis duration (Run Time)

Note

You must enter the point in time "Injection Lag" as a negative value in the time program. This time is added as a positive value to the "Cycle Time" in order to calculate the analysis duration.

- The analysis duration (Run Time) is the total of the parameter values "Injection Lag" and "Cycle Time" of the time program (Device Setup ➜ Method ➜ Events).
- "Injection Lag" allows commands to be executed prior to the injection time.

Current analysis time (Elapsed Time)

The current analysis time (Elapsed Time) is a relative time which starts with a value of zero at the starting time and ends with the value of the Run Time.

End of analysis

- The analysis stops at the time "Run Time", and the analysis clock is reset to zero.
- In "Cyclic Run" mode, the next analysis starts as soon as the chromatograph has reached the "Ready" state.
- In "Single Run" mode, the chromatograph switches to the "Hold" state.

8.5 Calibrating

Starting the calibration

The exact sequence is described in Section "Calibrating (Page 33) ff.".

Click the option box "Calibration" in the dialog box "Device Status" of the option box "Mode Select".

- The chromatograph executes a complete calibration process.

Stopping the calibration

Click the option box "Mode Select" in the dialog box "Device Status", and then the option box "Cancel Calibration".

- The chromatograph still continues up to the end of the current analysis.
- The results of the calibration analyses are subsequently rejected.
- The chromatograph then returns to the state it was in prior to the calibration: "Hold" or "Cyclic Run".

8.6 Standby

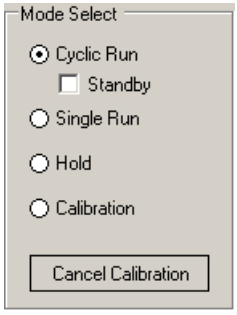
Select "Standby" mode if you only wish to analyze at certain times. This saves carrier gas.

Note

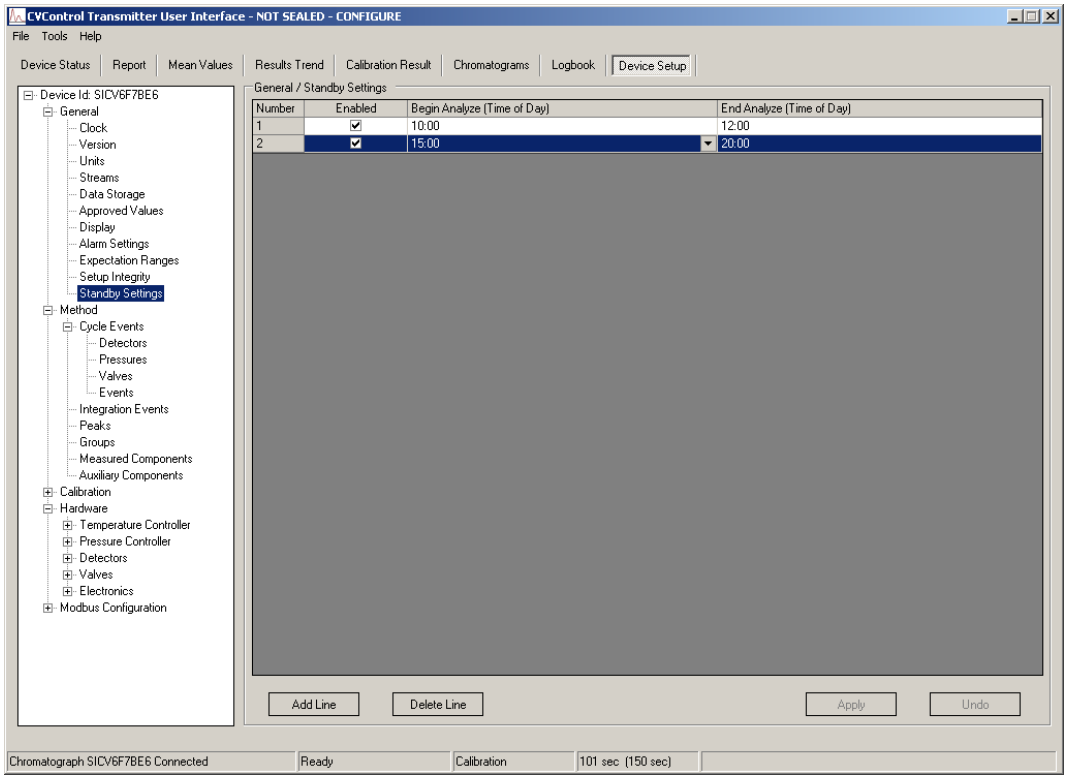
"Standby" mode can only be selected manually in "CONFIGURE" mode.
If "Standby" mode cannot be selected, e.g. in calibrated mode, parameterization of the country-specific setting is carried out.

Starting standby mode

1. Click the option box "Mode Select" in the tab "Device Status", and then the option box "Standby".



2. Click the tab "Device Setup", and select "Standby Settings" in the navigation box.
3. Enter the "Standby" values under "Number", e.g. in lines 1 and 2.

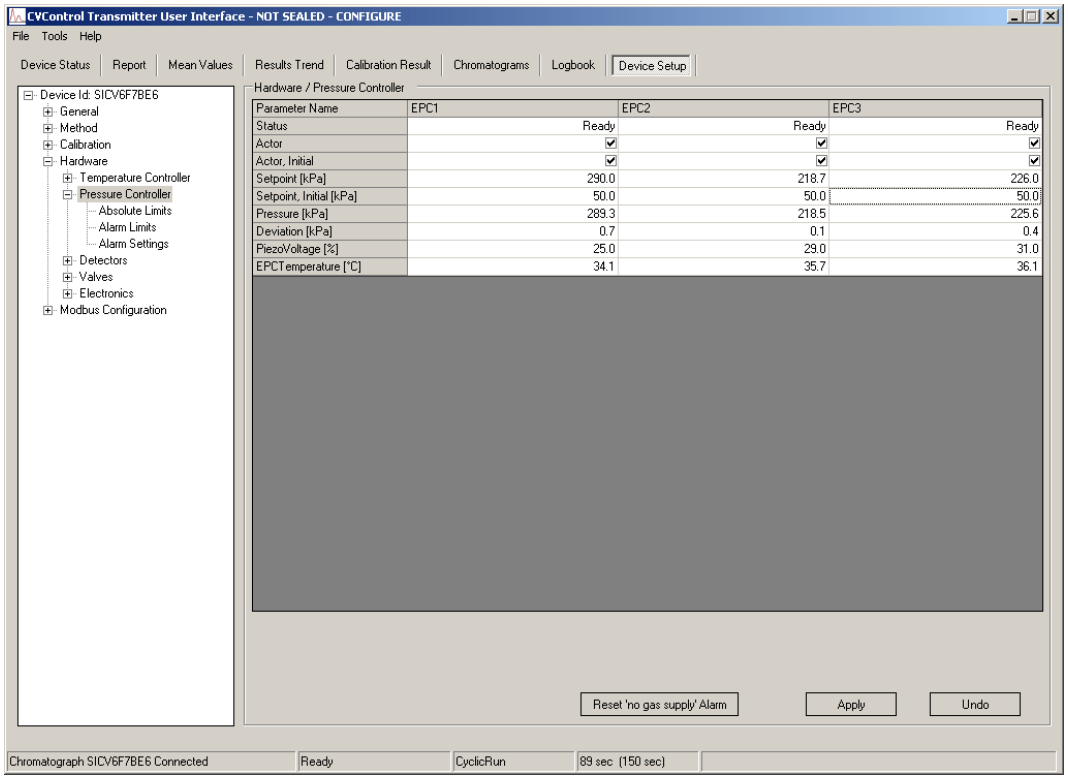


In this example, you are analyzing daily between 10:00 and 12:00 a.m. as well as between 03:00 and 08:00 p.m.

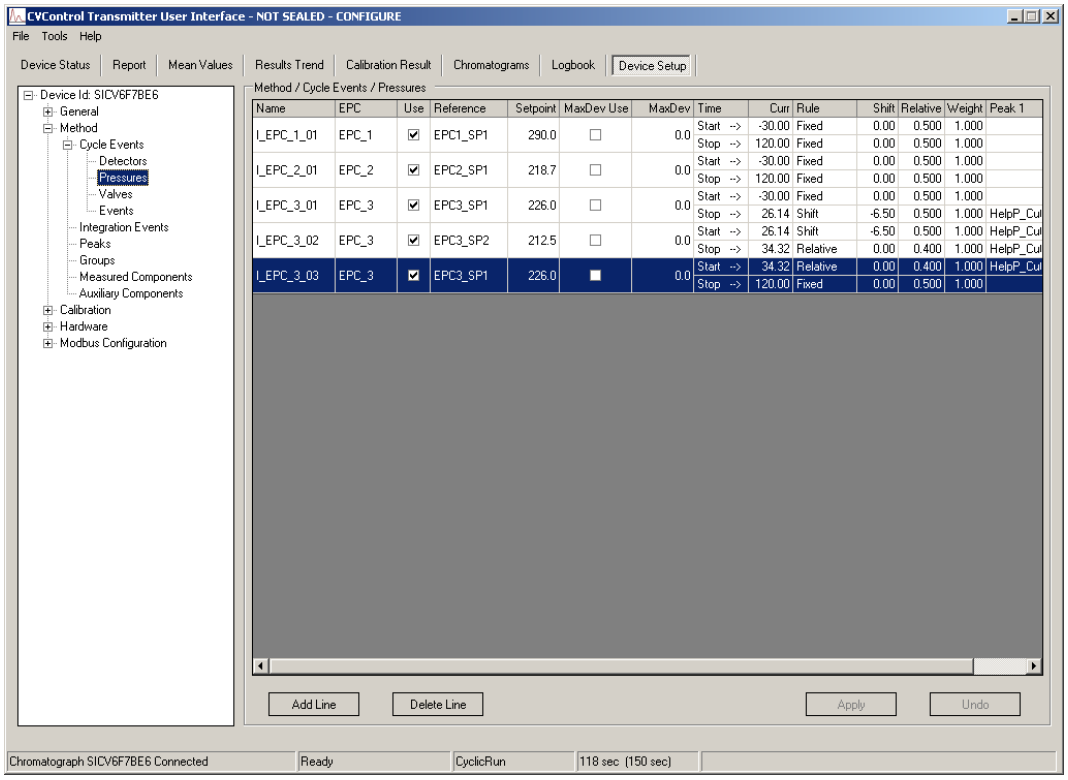
Result:

In "Standby" mode, the device returns to the **initialization pressures** and thus reduces the consumption of carrier gas (helium).

Example:
The initialization pressure (setpoint, initial [kPa]) is set to 50 kPa for the pressure controllers EPC1, EPC2 and EPC3, see the following window.



Switching procedure in the following window e.g. between 229 kPa and 214.4 kPa.


CVControl Transmitter User Interface - NOT SEALED - CONFIGURE
File Tools Help
Device Status Report Mean Values Results Trend Calibration Result Chromatograms Logbook Device Setup
Device Id: SICV6F7BE6
General
Method
Cycle Events
Detectors
Pressures
Valves
Events
Integration Events
Peaks
Groups
Measured Components
Auxiliary Components
Calibration
Hardware
Modbus Configuration
Method / Cycle Events / Pressures
Name EPC Use Reference Setpoint MaxDev Use MaxDev Time Curr Rule Shift Relative Weight Peak 1
I_EPC_1_01 EPC_1 EPC1_SP1 290.0 0.0 Start --> -30.00 Fixed 0.00 0.500 1.000
Stop --> 120.00 Fixed 0.00 0.500 1.000
I_EPC_2_01 EPC_2 EPC2_SP1 218.7 0.0 Start --> -30.00 Fixed 0.00 0.500 1.000
Stop --> 120.00 Fixed 0.00 0.500 1.000
I_EPC_3_01 EPC_3 EPC3_SP1 226.0 0.0 Start --> -30.00 Fixed 0.00 0.500 1.000
Stop --> 26.14 Shift -6.50 0.500 1.000 HelpP_Cul
I_EPC_3_02 EPC_3 EPC3_SP2 212.5 0.0 Start --> 26.14 Shift -6.50 0.500 1.000 HelpP_Cul
Stop --> 34.32 Relative 0.00 0.400 1.000 HelpP_Cul
I_EPC_3_03 EPC_3 EPC3_SP1 226.0 0.0 Start --> 34.32 Relative 0.00 0.400 1.000 HelpP_Cul
Stop --> 120.00 Fixed 0.00 0.500 1.000
Add Line
Delete Line
Apply
Undo
Chromatograph SICV6F7BE6 Connected
Ready
CyclicRun
118 sec (150 sec)

Note

Whenever measurements are being carried out, the pressures (setpoint 1 and setpoint 2) can switch back and forth between EPC3, e.g. between 229 kPa and 214.4 kPa.

8.7 Possible operations

Access mode

Which parameters you can change depends on the access mode. There are three access modes:

- MONITOR

  In "MONITOR" mode, most of the operating functions are disabled to prevent errors in measurement due to unintentional operations. You can still change a number of parameters, e.g. the enabling of samples.

- CONFIGURE

  You can change all parameters in "CONFIGURE" mode.

- Calibrated mode

  In calibrated mode, you can only use "MONITOR" mode. Changeover to "CONFIGURE" mode is password-protected. How this functions is described in detail in Section " Calibrating (Page 33) ".

Changing to "MONITOR" in access mode

1. Select the "Tools" menu in the window "CVControl", and then the function "Change Access Mode".
2. Select the access mode "MONITOR" in the box "Login". Then click "OK".
   – "NOT SEALED - MONITOR" is displayed in the title line.

Changing to "CONFIGURE" in access mode

Note

If the gas chromatograph is in calibrated mode, this mode is terminated when changing to "CONFIGURE" mode.

1. Select the "Tools" menu in the window "CVControl", and then the function "Change Access Mode".
2. Select the access mode "CONFIGURE" in the box "Login".
3. Enter the password, and then click "OK".
   – "NOT SEALED - CONFIGURE" is displayed in the title line.

Calibrated mode

Note

If you forget the password, you cannot leave calibrated mode.

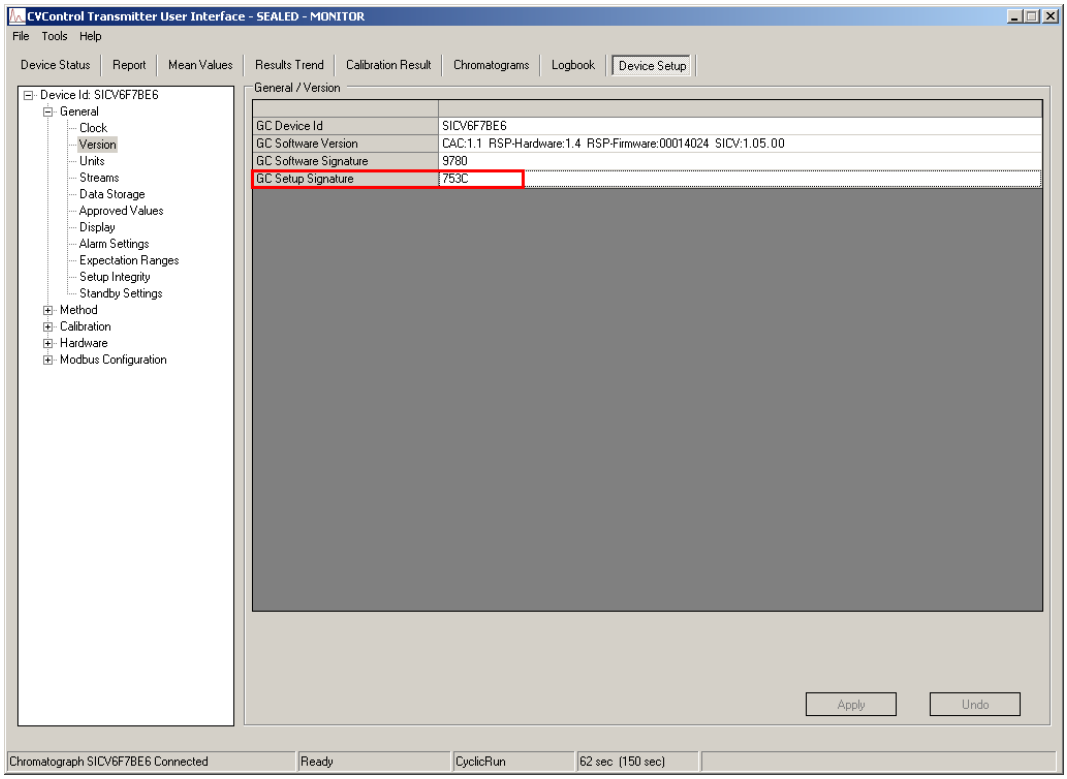
Note

- The calibration deputy records the checksums and the password.
- The checksums are saved in the device and are monitored.

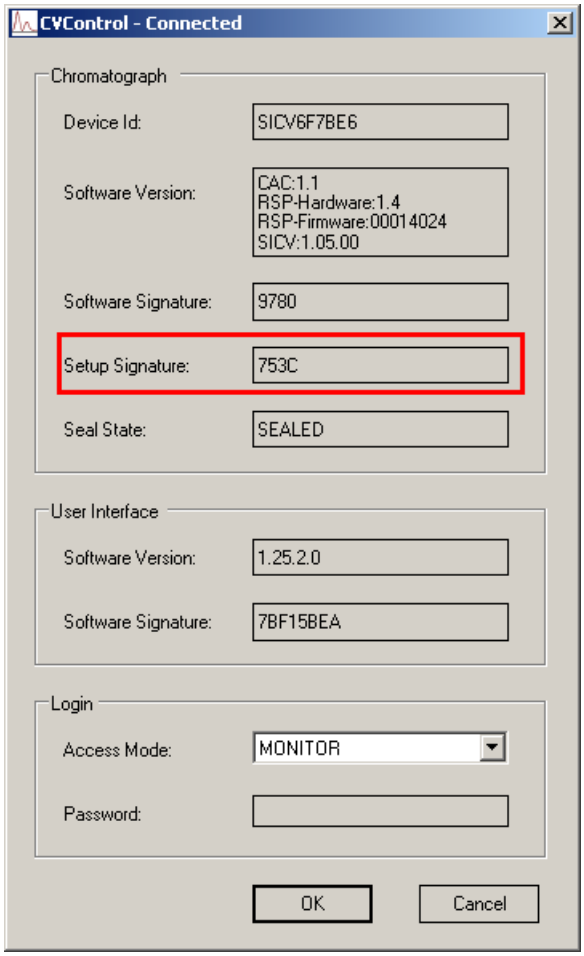
1. Change the access mode to MONITOR.
2. Select the function "Set new password" in the "Tools" menu.
   - Each password can only be used once.
   - When locking is repeated, you must assign a new password. For more information, refer to Section " Locking of operation for calibrated mode (Page 29) ".
   - "SEALED - MONITOR" is displayed in the title line.

Checksums

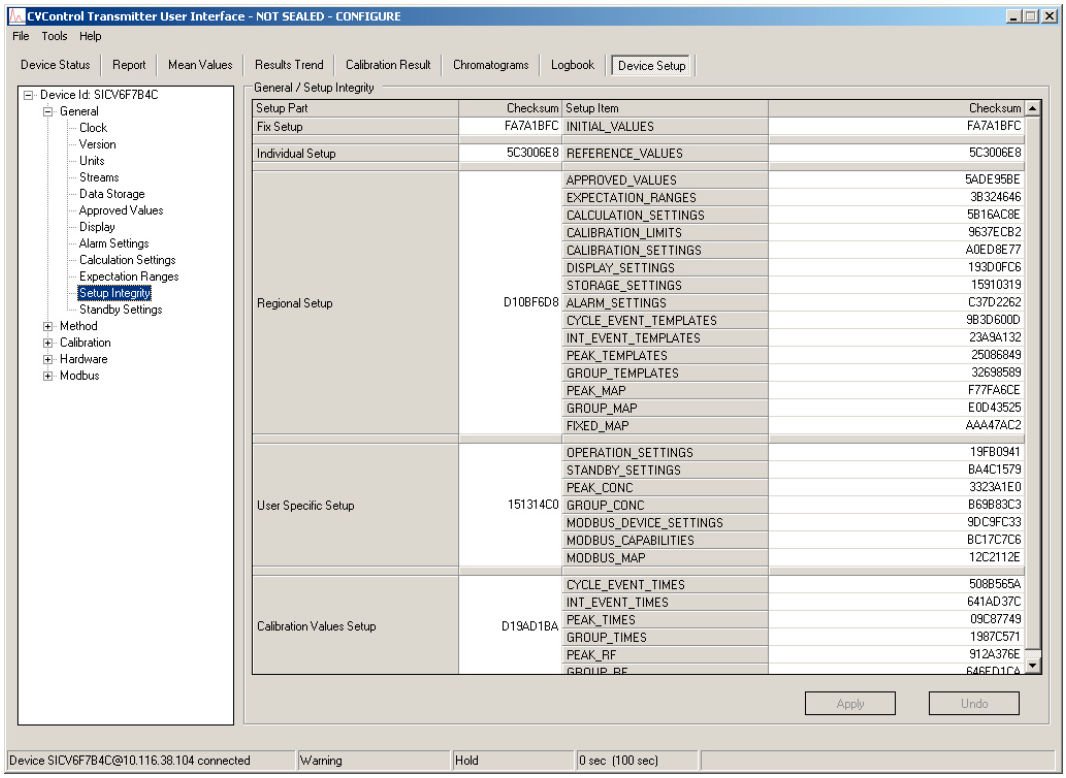
- The checksum for the complete programming of the factory setting is generated by the CVControl operating software. The checksum is monitored in "SEALED" mode.
- The checksum is visible in tab "Device Setup" in the line "GC Setup Signature" in the group "General", property object "Version".



- Alternatively, this checksum is displayed under:



- In addition to the total checksum, a partial checksum is assigned as follows by the operating software to each part of the factory setting.



Viewing and analysis of measured values

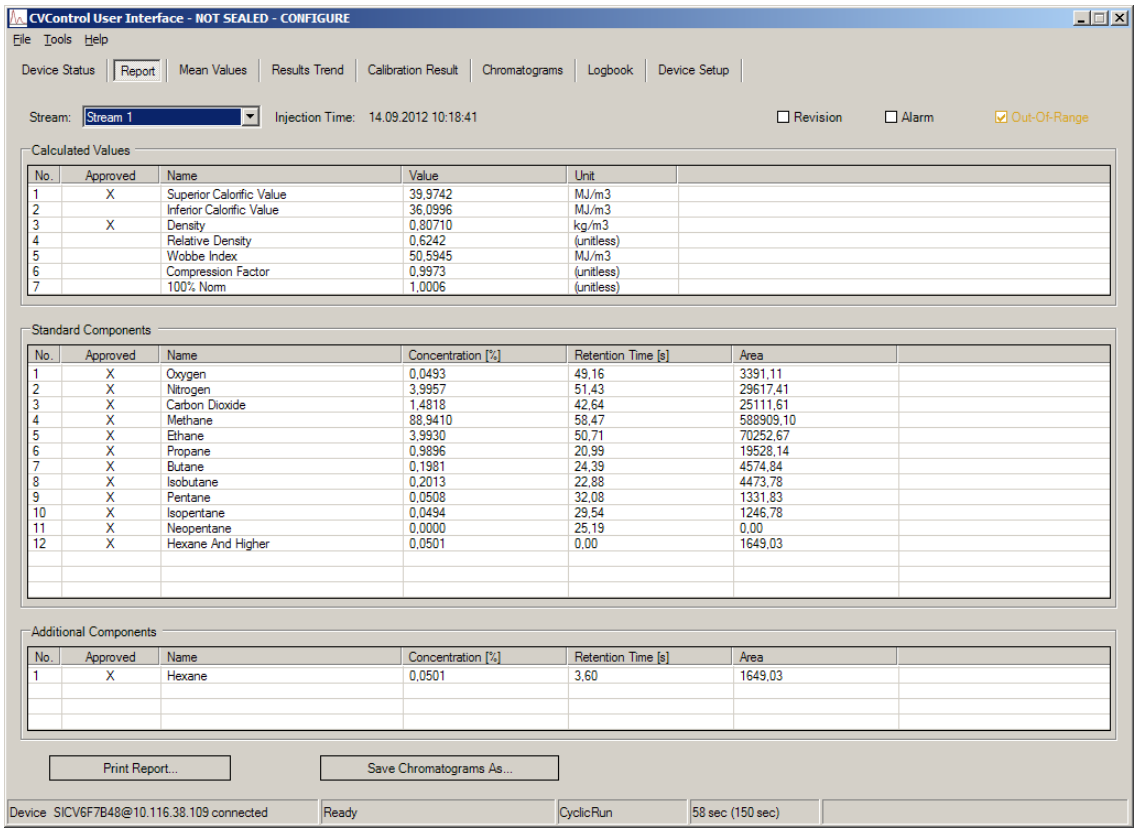
9

At the end of each analysis, the chromatograph saves the results of all components, the calorimetric values, all mean values, and the current chromatogram.

9.1 Displaying the results list (Report)

Procedure

The following example shows a gas mixture with 12 components.


CVControl User Interface - NOT SEALED - CONFIGURE
File Tools Help
Device Status Report Mean Values Results Trend Calibration Result Chromatograms Logbook Device Setup
Stream: Stream 1 Injection Time: 14.09.2012 10:18:41 Revision Alarm Out-Of-Range
Calculated Values
No. Approved Name Value Unit
1 X Superior Calorific Value 39,9742 MJ/m3
2 Inferior Calorific Value 36,0996 MJ/m3
3 X Density 0,80710 kg/m3
4 Relative Density 0,6242 (unitless)
5 Wobbe Index 50,5945 MJ/m3
6 Compression Factor 0,9973 (unitless)
7 100% Norm 1,0006 (unitless)
Standard Components
No. Approved Name Concentration [%] Retention Time [s] Area
1 X Oxygen 0,0493 49,16 3391,11
2 X Nitrogen 3,9957 51,43 29617,41
3 X Carbon Dioxide 1,4818 42,64 25111,61
4 X Methane 88,9410 58,47 588909,10
5 X Ethane 3,9930 50,71 70252,67
6 X Propane 0,9896 20,99 19528,14
7 X Butane 0,1981 24,39 4574,84
8 X Isobutane 0,2013 22,88 4473,78
9 X Pentane 0,0508 32,08 1331,83
10 X Isopentane 0,0494 29,54 1246,78
11 X Neopentane 0,0000 25,19 0,00
12 X Hexane And Higher 0,0501 0,00 1649,03
Additional Components
No. Approved Name Concentration [%] Retention Time [s] Area
1 X Hexane 0,0501 3,60 1649,03
Print Report...
Save Chromatograms As...
Device SICV6F7B48@10.116.38.109 connected
Ready
CyclicRun
58 sec (150 sec)

You can view the results list of the last analysis in the display "Report". Select the desired sample in "Sample Stream".

Description of parameters

- **Calorimetric values (Calculated Values)**

  These are the calculated values from the component concentrations according to the procedure entered in the tab "Device Setup ➜ Calibration ➜ Calibration Settings" under "Calculation Method".

- **Approved Value**

  If this column is ticked, this value/component is required or essential for fiscal metering.

- **Name**

  Is the name of the component or calorimetric value.

- **Value**

  Is the calorimetric value.

- **Unit**

  Is the unit of the calorimetric value.

- **Concentration**

  The chromatograph calculates the component concentration from the peak area and the calibration factor.

- **Retention Time**

  Is the actual retention time which the peak had in this analysis.

- **Area**

  Is the peak area in counted units.

Results which cannot be trusted

If faults have occurred during the analysis, the chromatograph indicates this in the tab "Report" by a tick at the top right for "Alarm". The corresponding results are zero for these analyses. These values are not included in generation of the mean value.

Printing of current result

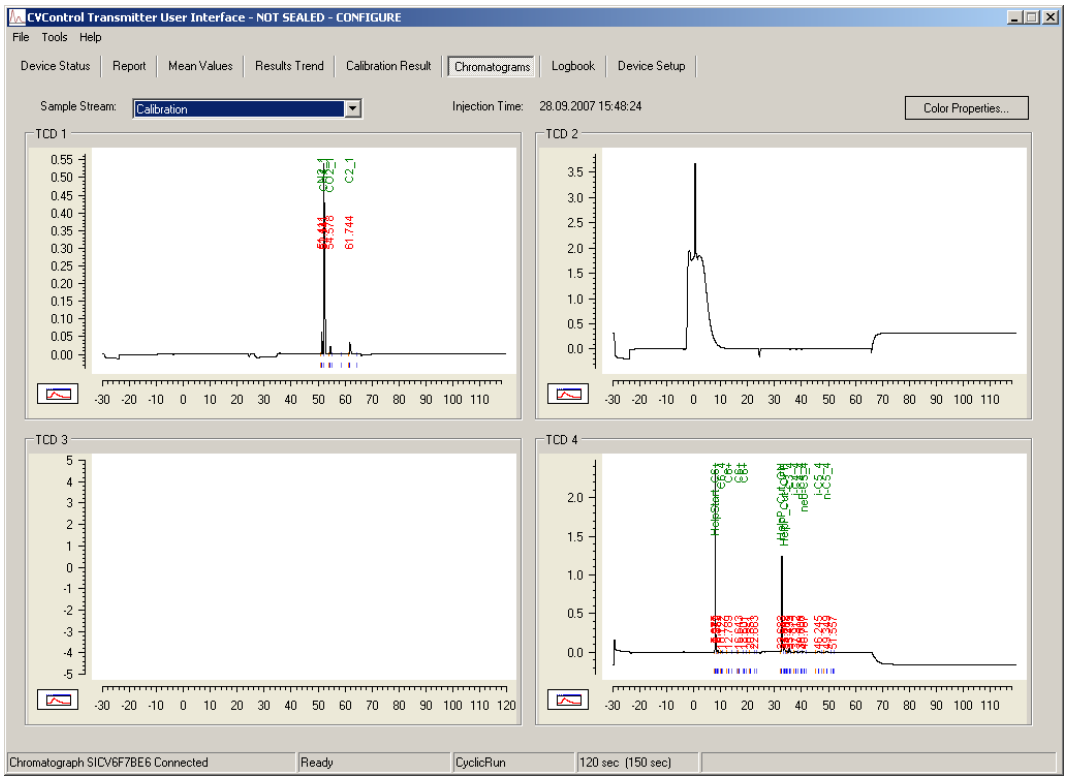
If a printer is connected to the PC, you can print out the results currently shown on the screen.

Click the "Print Report" button in the tab "Report":
the Windows print dialog is shown.

9.2 Displaying chromatograms

Display chromatograms of last analysis

1. Select the tab "Chromatograms".



2. Select the desired sample in "Sample Stream".

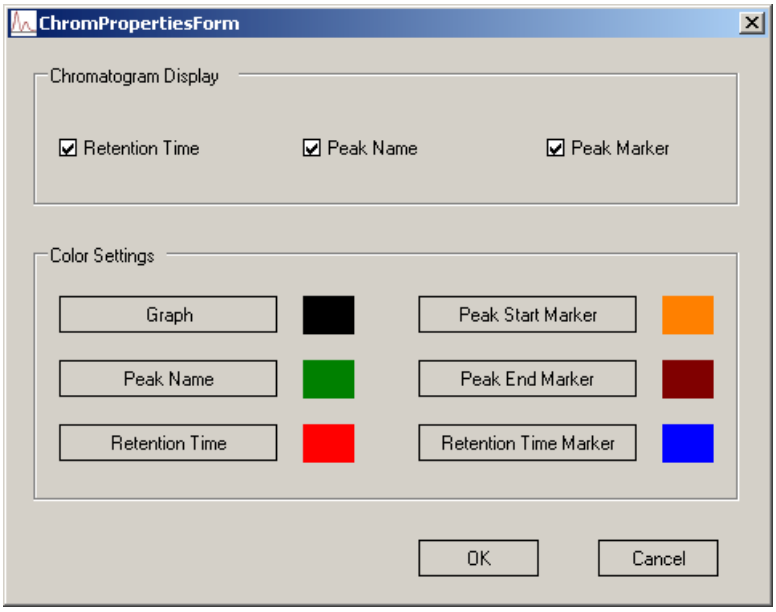
Increasing the chromatogram window

Click in one of the four small chromatogram symbols.

➜ The associated chromatogram is displayed in a separate scalable window.

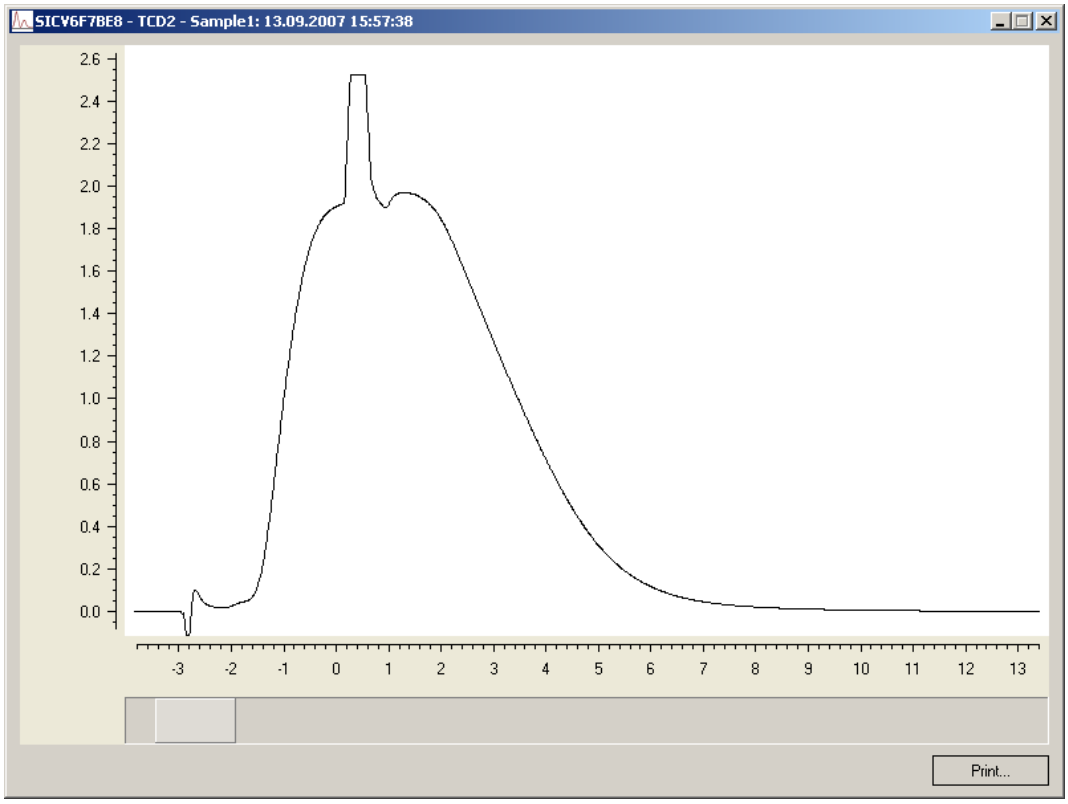
Parameterizing the representation

1. Click the "Color Properties" button.
2. Here you can select which information is to be displayed.
   - Retention time
   - Component (peak) name
   - Peak markers



3. You can select the colors for:
   - The chromatogram
   - The retention time
   - The component (peak) name
   - The peak markers

Scaling the chromatogram in the window



Drag the desired section using the mouse.

- Clicking with the right mouse button cancels one step at a time.
- The horizontal shift bar indicates the position of the zoomed area.
- You can also shift, increase or decrease the scaled area here.
- You can shift the chromatogram vertically by dragging the Y-scale with the mouse.

Printing the chromatogram

If a printer is connected to the PC, you can print out the chromatogram which is currently displayed in the window.

- Click the "Print" button.

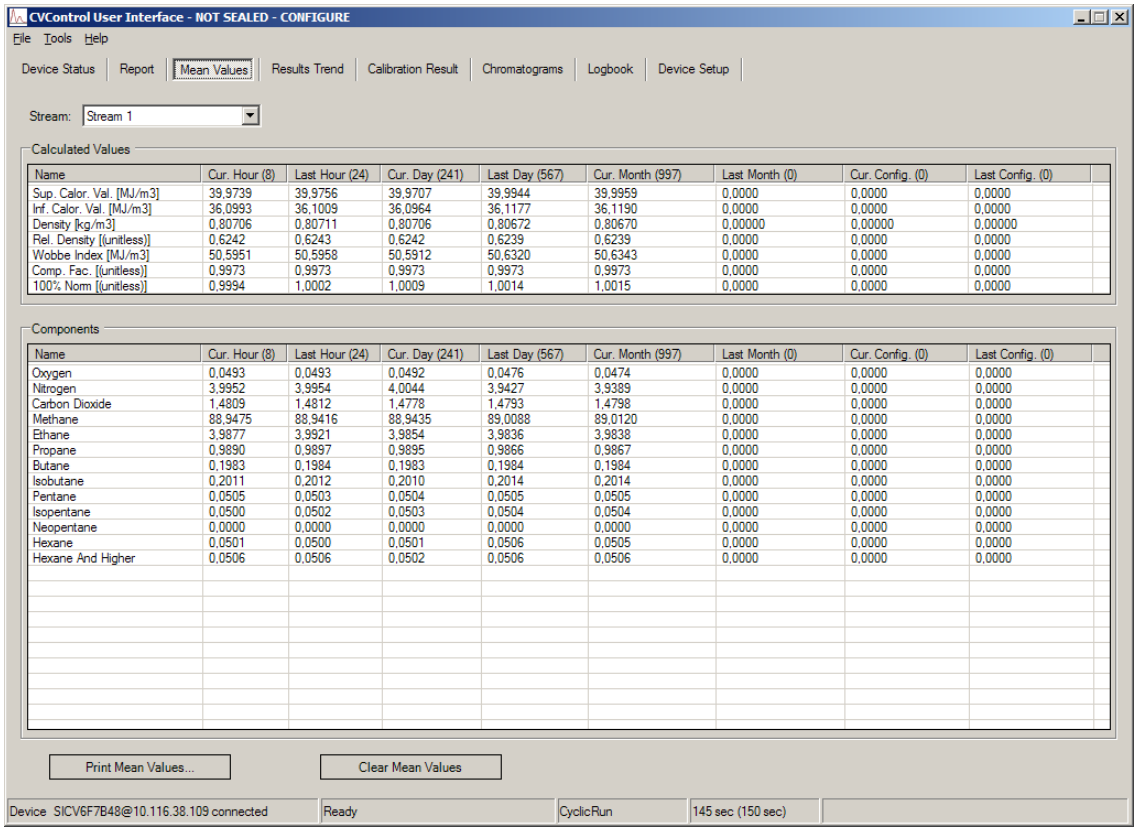
  The Windows print dialog is displayed.

9.3 Mean values

The chromatograph saves the mean values of all components and the calorimetric values. It is thus possible to track changes in the sample composition.

Displaying of mean values

- Select the tab "Mean Values".



Calculated Values								
Name	Cur. Hour (8)	Last Hour (24)	Cur. Day (241)	Last Day (567)	Cur. Month (997)	Last Month (0)	Cur. Config. (0)	Last Config. (0)
Sup. Calor. Val. [MJ/m3]	39,9739	39,9756	39,9707	39,9944	39,9959	0,0000	0,0000	0,0000
Inf. Calor. Val. [MJ/m3]	36,0993	36,1009	36,0964	36,1177	36,1190	0,0000	0,0000	0,0000
Density [kg/m3]	0,80706	0,80711	0,80706	0,80672	0,80670	0,00000	0,00000	0,00000
Rel. Density [(unitless)]	0,6242	0,6243	0,6242	0,6239	0,6239	0,0000	0,0000	0,0000
Wobbe Index [MJ/m3]	50,5951	50,5958	50,5912	50,6320	50,6343	0,0000	0,0000	0,0000
Comp. Fac. [(unitless)]	0,9973	0,9973	0,9973	0,9973	0,9973	0,0000	0,0000	0,0000
100% Norm [(unitless)]	0,9994	1,0002	1,0009	1,0014	1,0015	0,0000	0,0000	0,0000

Components								
Name	Cur. Hour (8)	Last Hour (24)	Cur. Day (241)	Last Day (567)	Cur. Month (997)	Last Month (0)	Cur. Config. (0)	Last Config. (0)
Oxygen	0,0493	0,0493	0,0492	0,0476	0,0474	0,0000	0,0000	0,0000
Nitrogen	3,9952	3,9954	4,0044	3,9427	3,9389	0,0000	0,0000	0,0000
Carbon Dioxide	1,4809	1,4812	1,4778	1,4793	1,4798	0,0000	0,0000	0,0000
Methane	88,9475	88,9416	88,9435	89,0088	89,0120	0,0000	0,0000	0,0000
Ethane	3,9877	3,9921	3,9854	3,9836	3,9838	0,0000	0,0000	0,0000
Propane	0,9890	0,9897	0,9895	0,9866	0,9867	0,0000	0,0000	0,0000
Butane	0,1983	0,1984	0,1983	0,1984	0,1984	0,0000	0,0000	0,0000
Isobutane	0,2011	0,2012	0,2010	0,2014	0,2014	0,0000	0,0000	0,0000
Pentane	0,0505	0,0503	0,0504	0,0505	0,0505	0,0000	0,0000	0,0000
Isopentane	0,0500	0,0502	0,0503	0,0504	0,0504	0,0000	0,0000	0,0000
Neopentane	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000	0,0000
Hexane	0,0501	0,0500	0,0501	0,0506	0,0505	0,0000	0,0000	0,0000
Hexane And Higher	0,0506	0,0506	0,0502	0,0506	0,0506	0,0000	0,0000	0,0000

The chromatograph displays the components and the calorimetric values for all sample streams:

– The mean values of the **current** hour, the current day, the current month, and the configured time period.

– The mean values of the **last** hour, the last day, the last month, and the configured time period.

Resetting of mean values

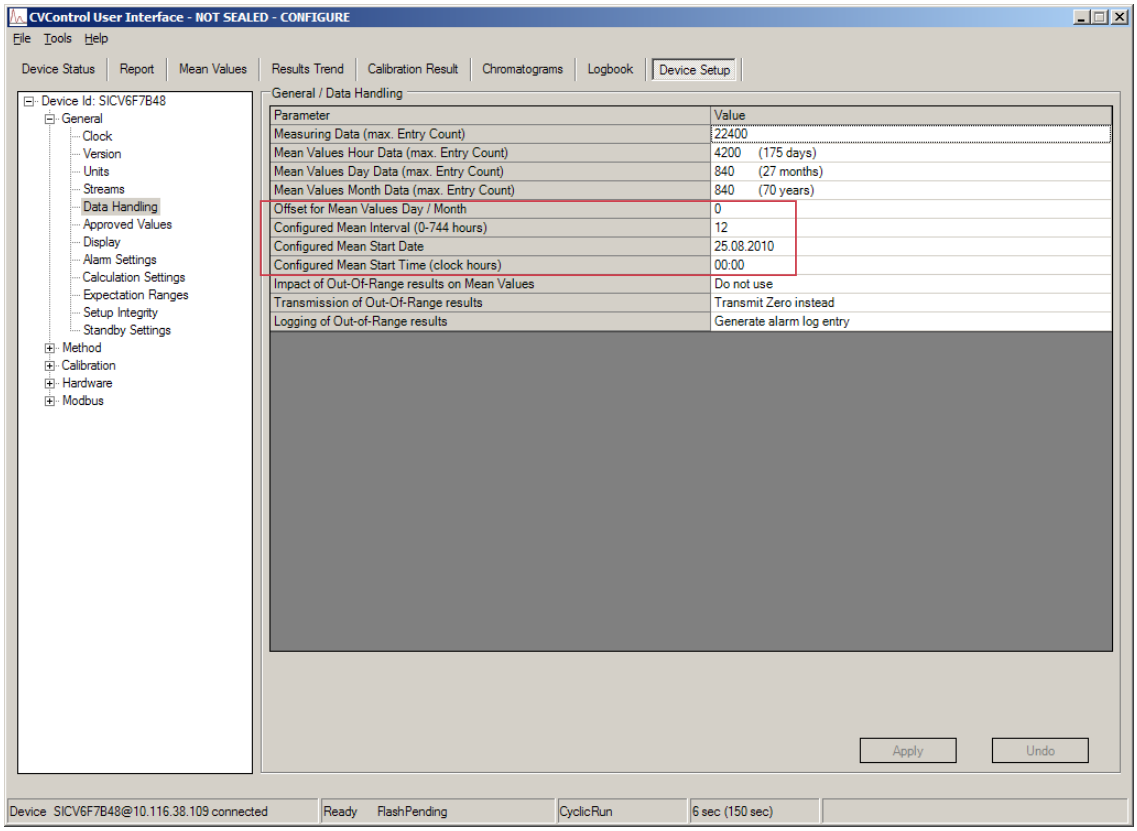
Note

All mean values are reset to zero.

Click the "Clear Mean Values" button in the tab "Mean Values".

Configurable mean value

- In the tab "Device Setup", open the property object "Data Handling" in the group "General".
- Here you can define your desired mean value:
  - Time offset
  - Interval
  - Start date
  - Start time



  - Influence of results exceeding the measuring range on calculation of the mean value
  - Forwarding of results exceeding the measuring range

Printing of mean values

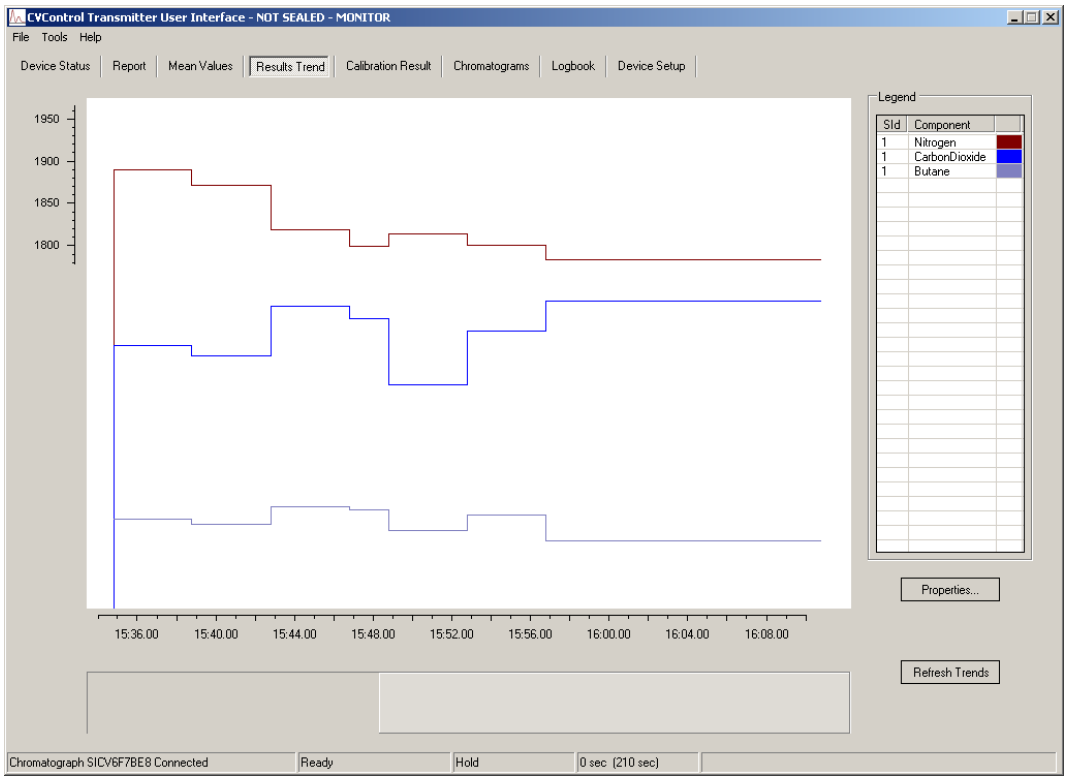
1. Click in the dialog box "Mean Values", and select the sample stream.
2. Click the "Print Mean Values" button:
   the Windows print dialog is shown.

9.4 Trends

Displaying a trend view

A trend display is possible over a maximum period of two weeks.

- Select the tab "Results Trend".



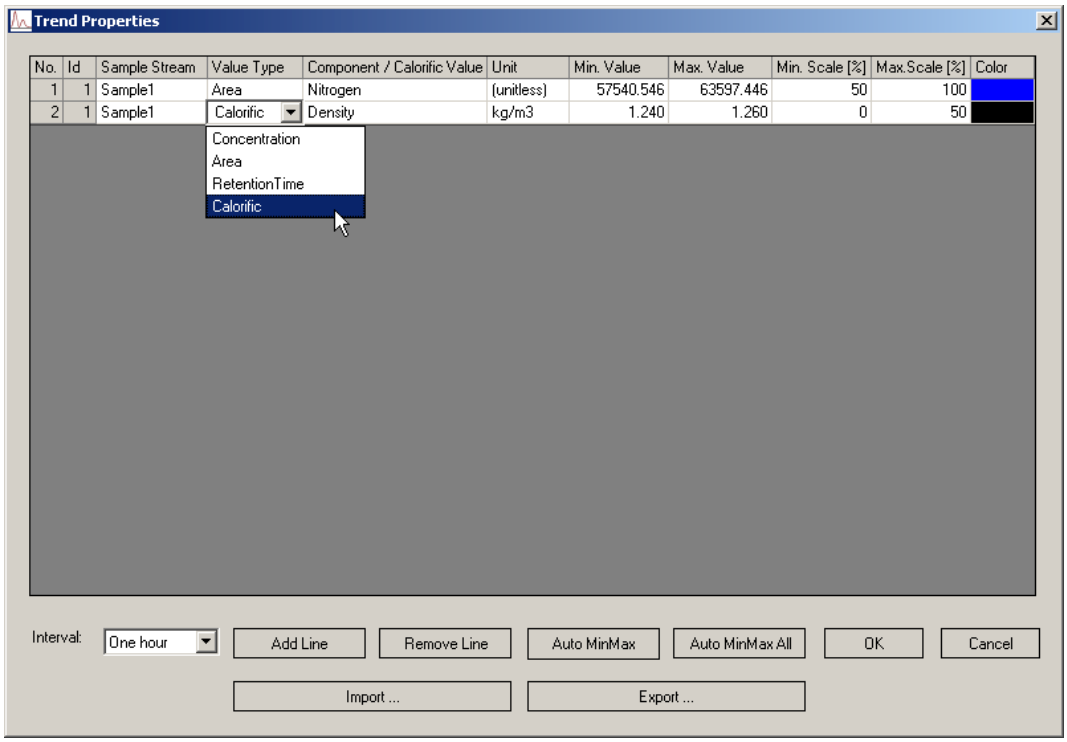
– The legend on the right in the window shows the line colors for the components.

Scaling a trend view

1. Click on one end of the bottom shift bar, and make smaller by dragging with the mouse.
2. Click on the reduced shift bar, and shift it to the desired position on the time axis.

Parameterizing the trend display

1. Click the "Properties" button in the tab "Results Trend".



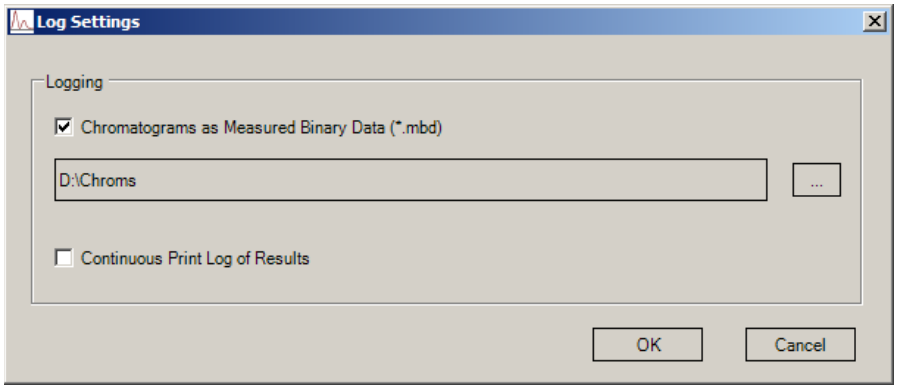
2. You can make the following settings in the dialog box "Trend Properties":

Setting	Procedure
Define the time interval of the display	• Select in the drop-down list "Interval". – One hour – 12 hours – One day – One week – two weeks
Add Line	Click the "Add Line" button.
Remove Line	First select the line, and then click on the "Remove Line" button.
Edit type of line	• Click on the right in the box "Sample Stream", and select the sample. • In the box "Value Type", select between: – "Concentration", "Area" – "Retention Time" – "Calorific" • Select the component in the box "Component / Calorific Value", or select between: – "Superior Calorific Value" – "Interior Calorific Value" – "Density" – "Relative Density" – "Wobbe Index"
Expand display	• Enter the desired lower limit for "Min. Value" and the upper limit for "Max. Value". • Alternatively you can click on the "Auto Min Max" button to allow automatic selection of the smallest and largest values from the history for "Min. Value" and "Max. Value".
Enter scale	Enter the vertical range in the window for "Min. Scale" and "Max. Scale" (0% = right at bottom, 100% = right at top) such that the lines do not overlap.
Set line color	• Click the "Set Color" button and select the color. • Confirm with "OK".

9.5 Collecting and exporting results

Continuous saving of chromatograms as .mbd file on the hard disk

1. Mark the parameter "Chromatograms as Measured Binary Data (*.mbd)" with a tick in the menu "Tools ➜ Log Settings".

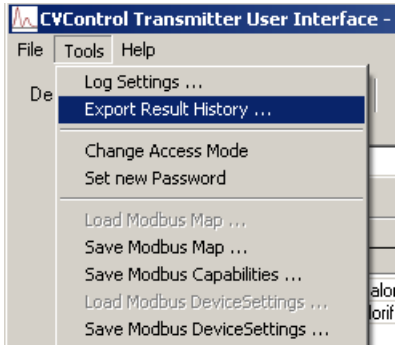


2. Enter the directory (with drive) in which the results are to be saved.
   - A file is produced in this directory for each analysis.
   - The file name is generated according to the pattern Date_Time_Sample_Consecutive number, e.g. 20070928_121605_Stream1_000017.mbd
   - The consecutive number is reset to 1 if the chromatograph is switched off or reset.

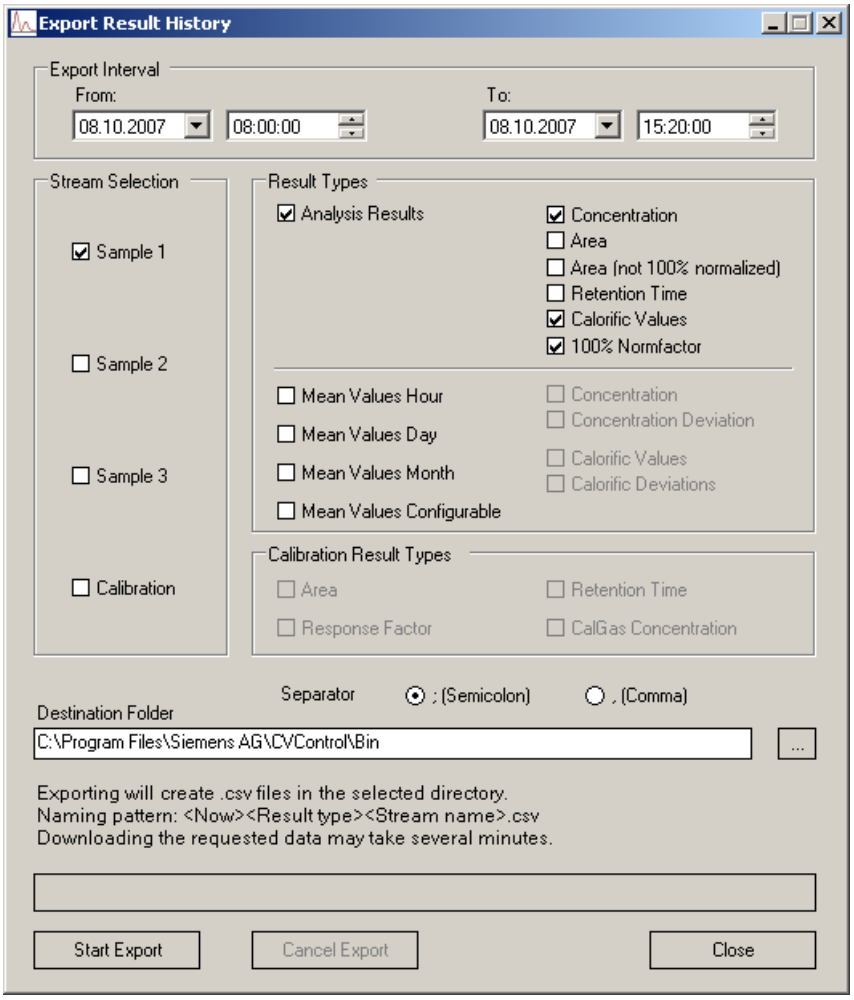
The file in .mbd format contains the results in 'Measured Binary Data' format.
This data is only provided for service purposes and cannot be read using CVControl.

Saving of analysis results as CSV file on the hard disk

1. Open the menu command "Export Result History" in the "Tools" menu.



2. Define the desired save options by selecting:
   - The time interval for saving results
   - The desired sample stream
   - The desired results (mean values or calibration values)
   - The saving location



3. Start the data saving with the "Start Export" button.
4. Following selection of the save options, click the "Close" button to exit the dialog box "Export Result History".

Saving of current result on hard disk

1. In the report window, click on the "Save Results As..." button, or select the function "Save Results As..." in the "File" menu.
2. Select the directory and file name.
   - The current result is then saved as a .mbd file (Maxum Binary Data).

9.6 Continuous printout of data relevant to calibration

Requirements

1. The PC with the CVControl operating software and the sealed SITRANS CV process gas chromatograph are connected together and in operation.
2. An interval for the printout is set for a commercially available printer.

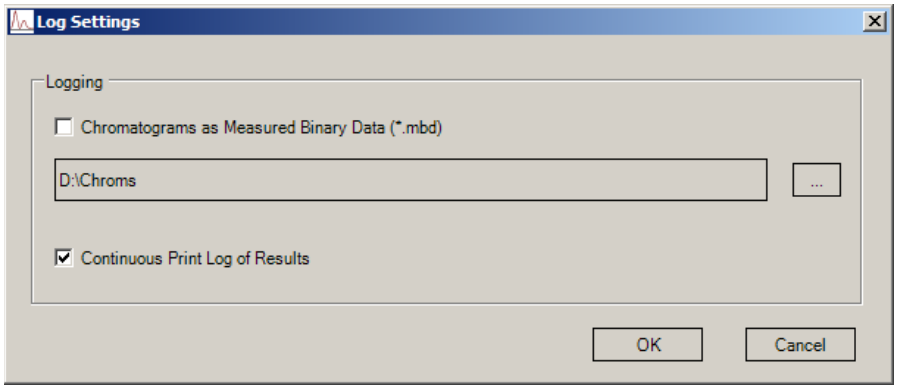
Note

Printing interval

We recommend setting of the interval to 2 hours since a printout for this period approximately fits on a DIN A4 page. Set the time interval to 2 hours in the "ngcontrol.config" file of the CVControl operating software.

Starting of printing

1. Mark the parameter "Continuous Print Log of Results" with a tick in the menu "Tools ➜ Log Settings".



2. Click "OK" to confirm.

Stopping of printing

1. Remove the tick from the parameter "Enable Continuous Print Log" in the menu "Tools ➜ Log Settings".
2. Click "OK" to confirm.

Description of functions

- The values relevant to calibration for all analyses of the last completed interval are printed out at defined intervals (e.g. 1 to 2 hours).
- A successful printout is recorded in a log file on the PC.
- If a printout fails, it is not recorded in the log file.
- If a printout has not yet been made, the last 4 days are printed.
- Prior to printing, a check is made to see whether previous print jobs are missing in the log file. If print jobs are not more than e.g. 4 days beforehand, they are repeated. This guarantees that all required values are printed out even with problems such as a power failure or no paper in the printer.

Contents of the printout

Line 1

Text	Description
Date	Date of analyses
Period	Monitoring period
Chromatograph	ID of the gas chromatograph
State	"Approved" state means: measured values are subject to obligation of verification
Setup Signature	Checksum of factory settings
Analyses	Number of analyses
Page	Page number

Line 2

Text	Description	Text	Description
Time [hh:mm:ss]	Time in seconds	**C1** [Mol %]	Methane
S = Sample	Sample stream	**C2** [Mol %]	Ethane
O = Out of Range	Expected range violated	**C3** [Mol %]	Propane
A = Alarm	Alarm during an analysis	**nC4** [Mol %]	Butane
R = Revision	Digital input was set to revision	**iC4** [Mol %]	2-methyl propane
GHV [MJ/m^3]	Calorific value	**nC5** [Mol %]	Pentane
Dens [kg / m^3]	Density	**iC5** [Mol %]	2-methyl butane
N2 [Mol %]	Nitrogen	**neoC5** [Mol %]	2,2-dimethyl propane
CO2 [Mol %]	Carbon dioxide	**C6** [Mol %]	Hexane and higher hydrocarbons

Example of a printout

Date: 2007-11-05; Period: 08-10; Chromatograph: SICV6F7B4C; State: NotApproved; Setup Signature: 26C5; Analyses: 47

Time:	S:	O:	A:	R:	GHV:	Dens:	N2:	CO2:	C1:	C2:	C3:	nC4:	iC4:	nC5:	iC5:	neoC5:	C6
08:01:48;	1;	X;	.;	.;	40.1557;	0.8117;	04.0819;	01.5010;	88.6460;	04.0859;	01.0095;	00.2085;	00.2030;	00.0527;	00.0511;	00.0506;	00.0517
08:04:20;	1;	X;	.;	.;	40.1579;	0.8114l;	04.0636;	01.4937;	88.6951;	04.0651;	01.0068;	00.2085;	00.2031;	00.0528;	00.0510;	00.0505;	00.0517
08:06:52;	1;	X;	.;	.;	40.1513;	0.8113g;	04.0667;	01.4971;	88.6921;	04.0653;	01.0063;	00.2078;	00.2025;	00.0526;	00.0508;	00.0505;	00.0513
08:09:24;	1;	X;	.;	.;	40.1575;	0.8119s;	04.0877;	01.5038;	88.6238;	04.0970;	01.0118;	00.2079;	00.2032;	00.0532;	00.0512;	00.0507;	00.0523
08:11:56;	1;	X;	.;	.;	40.1632;	0.8117?;	04.0736;	01.4989;	88.6547;	04.0864;	01.0080;	00.2084;	00.2028;	00.0528;	00.0514;	00.0506;	00.0517
08:14:28;	1;	X;	.;	.;	40.1594;	0.8119l;	04.0815;	01.5042;	88.6338;	04.0916;	01.0108;	00.2094;	00.2032;	00.0532;	00.0514;	00.0512;	00.0518
08:17:00;	1;	X;	.;	.;	40.1608;	0.8114?;	04.0596;	01.4940;	88.6910;	04.0758;	01.0052;	00.2079;	00.2021;	00.0531;	00.0510;	00.0505;	00.0517
08:19:31;	1;	X;	.;	.;	40.1573;	0.8118?;	04.0813;	01.5022;	88.6459;	04.0830;	01.0094;	00.2091;	00.2039;	00.0529;	00.0512;	00.0510;	00.0519
08:22:03;	1;	X;	.;	.;	40.1543;	0.8112s;	04.0593;	01.4935;	88.7056;	04.0638;	01.0051;	00.2079;	00.2030;	00.0526;	00.0507;	00.0508;	00.0516
08:24:35;	1;	X;	.;	.;	40.1511;	0.8116d;	04.0802;	01.5003;	88.6584;	04.0793;	01.0084;	00.2081;	00.2028;	00.0525;	00.0510;	00.0506;	00.0520
08:27:07;	1;	X;	.;	.;	40.1532;	0.8116?;	04.0769;	01.5001;	88.6616;	04.0786;	01.0087;	00.2082;	00.2028;	00.0526;	00.0515;	00.0506;	00.0512
08:29:39;	1;	X;	.;	.;	40.1594;	0.8119?;	04.0816;	01.5049;	88.6339;	04.0897;	01.0114;	00.2098;	00.2032;	00.0530;	00.0513;	00.0513;	00.0522
08:32:11;	1;	X;	.;	.;	40.1551;	0.8117?;	04.0775;	01.5023;	88.6545;	04.0799;	01.0098;	00.2082;	00.2037;	00.0527;	00.0519;	00.0508;	00.0520
08:34:43;	1;	X;	.;	.;	40.1526;	0.8115d;	04.0743;	01.4990;	88.6714;	04.0734;	01.0081;	00.2082;	00.2024;	00.0526;	00.0514;	00.0504;	00.0515
08:37:15;	1;	X;	.;	.;	40.1511;	0.8115d;	04.0767;	01.4980;	88.6721;	04.0725;	01.0070;	00.2074;	00.2028;	00.0529;	00.0511;	00.0503;	00.0517
08:39:46;	1;	X;	.;	.;	40.1515;	0.8113g;	04.0678;	01.4965;	88.6864;	04.0718;	01.0063;	00.2069;	00.2023;	00.0528;	00.0508;	00.0508;	00.0517
08:42:18;	1;	X;	.;	.;	40.1508;	0.8115d;	04.0735;	01.5004;	88.6741;	04.0708;	01.0075;	00.2080;	00.2028;	00.0530;	00.0510;	00.0507;	00.0512
08:44:50;	1;	X;	.;	.;	40.1524;	0.8117?;	04.0812;	01.5030;	88.6539;	04.0759;	01.0100;	00.2088;	00.2030;	00.0531;	00.0516;	00.0510;	00.0521
08:47:22;	1;	X;	.;	.;	40.1544;	0.8116g;	04.0770;	01.5017;	88.6635;	04.0731;	01.0077;	00.2081;	00.2034;	00.0528;	00.0509;	00.0507;	00.0515
08:49:54;	1;	X;	.;	.;	40.1571;	0.8117l;	04.0759;	01.5008;	88.6554;	04.0827;	01.0091;	00.2083;	00.2037;	00.0528;	00.0515;	00.0507;	00.0518
08:52:26;	1;	X;	.;	.;	40.1483;	0.8113g;	04.0712;	01.4967;	88.6938;	04.0583;	01.0073;	00.2080;	00.2024;	00.0528;	00.0508;	00.0504;	00.0514
08:54:58;	1;	X;	.;	.;	40.1502;	0.8116d;	04.0792;	01.5021;	88.6653;	04.0690;	01.0097;	00.2078;	00.2030;	00.0530;	00.0512;	00.0506;	00.0517
08:57:30;	1;	X;	.;	.;	40.1568;	0.8118?;	04.0805;	01.5032;	88.6453;	04.0841;	01.0098;	00.2083;	00.2032;	00.0530;	00.0519;	00.0509;	00.0517
09:00:02;	1;	X;	.;	.;	40.1589;	0.8115?;	04.0712;	01.4953;	88.6716;	04.0786;	01.0079;	00.2082;	00.2028;	00.0526;	00.0512;	00.0507;	00.0519
09:02:34;	1;	X;	.;	.;	40.1532;	0.8115g;	04.0780;	01.4974;	88.6658;	04.0767;	01.0080;	00.2079;	00.2025;	00.0529;	00.0513;	00.0505;	00.0520
09:05:06;	1;	X;	.;	.;	40.1529;	0.8115g;	04.0751;	01.4997;	88.6706;	04.0719;	01.0074;	00.2082;	00.2029;	00.0531;	00.0512;	00.0507;	00.0517
09:07:38;	1;	X;	.;	.;	40.1554;	0.8115g;	04.0713;	01.4996;	88.6709;	04.0766;	01.0068;	00.2072;	00.2031;	00.0526;	00.0509;	00.0506;	00.0514
09:10:10;	1;	X;	.;	.;	40.1516;	0.8118d;	04.0848;	01.5066;	88.6368;	04.0858;	01.0111;	00.2083;	00.2035;	00.0528;	00.0516;	00.0507;	00.0518
09:12:42;	1;	X;	.;	.;	40.1624;	0.8117d;	04.0752;	01.4983;	88.6508;	04.0915;	01.0066;	00.2080;	00.2029;	00.0529;	00.0513;	00.0507;	00.0520
09:15:15;	1;	X;	.;	.;	40.1522;	0.8113d;	04.0657;	01.4953;	88.7006;	04.0598;	01.0045;	00.2073;	00.2028;	00.0525;	00.0507;	00.0507;	00.0519
09:17:47;	1;	X;	.;	.;	40.1524;	0.8112d;	04.0606;	01.4930;	88.7157;	04.0539;	01.0033;	00.2071;	00.2020;	00.0526;	00.0511;	00.0505;	00.0517
09:20:19;	1;	X;	.;	.;	40.1503;	0.8118d;	04.0854;	01.5057;	88.6443;	04.0788;	01.0103;	00.2082;	00.2031;	00.0530;	00.0513;	00.0507;	00.0514
09:22:51;	1;	X;	.;	.;	40.1541;	0.8116s;	04.0778;	01.4995;	88.6607;	04.0790;	01.0081;	00.2079;	00.2031;	00.0528;	00.0511;	00.0506;	00.0518
09:25:23;	1;	X;	.;	.;	40.1563;	0.8118l;	04.0817;	01.5023;	88.6403;	04.0905;	01.0090;	00.2082;	00.2044;	00.0528;	00.0510;	00.0509;	00.0517
09:27:55;	1;	X;	.;	.;	40.1522;	0.8118?;	04.0864;	01.5046;	88.6401;	04.0813;	01.0115;	00.2082;	00.2037;	00.0529;	00.0516;	00.0511;	00.0521
09:30:27;	1;	X;	.;	.;	40.1539;	0.8116?;	04.0792;	01.4978;	88.6598;	04.0796;	01.0092;	00.2083;	00.2031;	00.0527;	00.0514;	00.0507;	00.0517
09:32:59;	1;	X;	.;	.;	40.1632;	0.8116l;	04.0660;	01.4963;	88.6608;	04.0977;	01.0051;	00.2078;	00.2026;	00.0526;	00.0509;	00.0506;	00.0518
09:35:31;	1;	X;	.;	.;	40.1598;	0.8118?;	04.0820;	01.4980;	88.6449;	04.0893;	01.0086;	00.2080;	00.2030;	00.0528;	00.0510;	00.0506;	00.0517
09:38:03;	1;	X;	.;	.;	40.1527;	0.8116?;	04.0772;	01.5016;	88.6635;	04.0745;	01.0082;	00.2070;	00.2033;	00.0529;	00.0513;	00.0505;	00.0516
09:40:35;	1;	X;	.;	.;	40.1516;	0.8115?;	04.0770;	01.4988;	88.6724;	04.0698;	01.0067;	00.2074;	00.2037;	00.0526;	00.0513;	00.0506;	00.0512
09:43:07;	1;	X;	.;	.;	40.1591;	0.8119d;	04.0853;	01.5033;	88.6271;	04.0956;	01.0116;	00.2085;	00.2041;	00.0530;	00.0511;	00.0505;	00.0520
09:45:39;	1;	X;	.;	.;	40.1508;	0.8115g;	04.0771;	01.5004;	88.6647;	04.0761;	01.0082;	00.2085;	00.2032;	00.0527;	00.0510;	00.0507;	00.0517
09:48:11;	1;	X;	.;	.;	40.1553;	0.8118d;	04.0843;	01.5011;	88.6427;	04.0865;	01.0091;	00.2083;	00.2031;	00.0530;	00.0514;	00.0508;	00.0516
09:50:43;	1;	X;	.;	.;	40.1505;	0.8115d;	04.0748;	01.4997;	88.6760;	04.0668;	01.0088;	00.2081;	00.2030;	00.0527;	00.0511;	00.0508;	00.0520
09:53:15;	1;	X;	.;	.;	40.1544;	0.8119?;	04.0866;	01.5053;	88.6294;	04.0922;	01.0106;	00.2088;	00.2037;	00.0527;	00.0513;	00.0508;	00.0517
09:55:47;	1;	X;	.;	.;	40.1478;	0.8114?;	04.0730;	01.4980;	88.6846;	04.0657;	01.0068;	00.2072;	00.2033;	00.0525;	00.0513;	00.0503;	00.0514
09:58:20;	1;	X;	.;	.;	40.1549;	0.8115d;	04.0726;	01.4975;	88.6770;	04.0701;	01.0068;	00.2081;	00.2033;	00.0525;	00.0511;	00.0508;	00.0518

9.7 Calculation formulae

9.7.1 Calculation of response factors for the calibrated components

The calculation is done using the following formula:

$$R_k = \frac{A_k^{cal}}{C_k^{cal}}$$

Meaning of the various parameters:

k	Component index
R_k	Response factor of component k
A_k^{cal}	Area of component k in the calibration sample recorded during the calibration process. This can be a mean area.
C_k^{cal}	Concentration of component k in the calibration gas certificate

9.7.2 Calculation of standardized areas for calibration

This factor is calculated in accordance with the GOST standard.

The calculation is carried out using the following formula:

$$CF_k = \frac{C_k^{cal}}{A_k}$$

Meaning of the various parameters:

k	Component index k
CF_k	Calibration factor of component k
A_k	Area of component k in the calibration sample recorded during the calibration process. This can be a mean area.
C_k^{cal}	Concentration of component k in the calibration gas certificate

9.7.3 Calculation of standardized concentration from the peak area

The calculation is carried out using the following formula:

$$C_k^M = \frac{A_k^M}{R_k} \qquad n_{100} = \frac{100\%}{\sum_k C_k^M} \qquad C_k^{nor} = C_k^M = n_{100}$$

Meaning of the various parameters:

k	Component index k
R_k	Response factor of component k
A_k^M	Area of component k in the measured sample recorded during the measurement.
C_k^M	Concentration of component k calculated from the measured area and the associated response factor.
n_{100}	100 % standardization factor calculated from the concentrations of all measured components
C_k^{nor}	Concentration corrected by standardization factor n_{100}

Transmission of results over Modbus 10

10.1 The Modbus interface

Modbus

MODBUS is an industry standard for linking measuring and control instruments to process control systems and volume conversion devices (flow computers).

People use the telephone ...

This only functions if certain prerequisites are fulfilled:

- Electrical connection
  - An electrical connection must be present between the two telephones.
  - The electrical characteristics of the telephones must correspond.
- Control of conversation
  - Rules of courtesy must be observed to control the conversation, and both partners must agree on the rules!
- Language and understanding of what the partner says:
  - The two partners must speak the same language or at least understand the other partner's language.
  - The partners must understand the context. And they must be aware of what they should do with the information!

... chromatographs use interfaces

Chromatographs and process control systems/flow computers use special electronic circuits which we call interfaces. Certain prerequisites must also be fulfilled here:

- Electrical connection
  - The interfaces of the devices are connected by electric cables.
  - The electrical properties of the interfaces are standardized, but there are different types of interface. Only interfaces of the same type may be connected together! We use RS-232/RS-485.
- Control of conversation and language
  - Rules of courtesy and language are covered by the term **Modbus**.
- Understand what the partner says
  - Common memory area in the process control system/flow computer.

    The process control system/flow computer contains a memory area which the chromatograph can write via the Modbus interface. The software of the process control system/flow computer can read this information. The chromatograph and process control system/flow computer therefore communicate through this memory area.

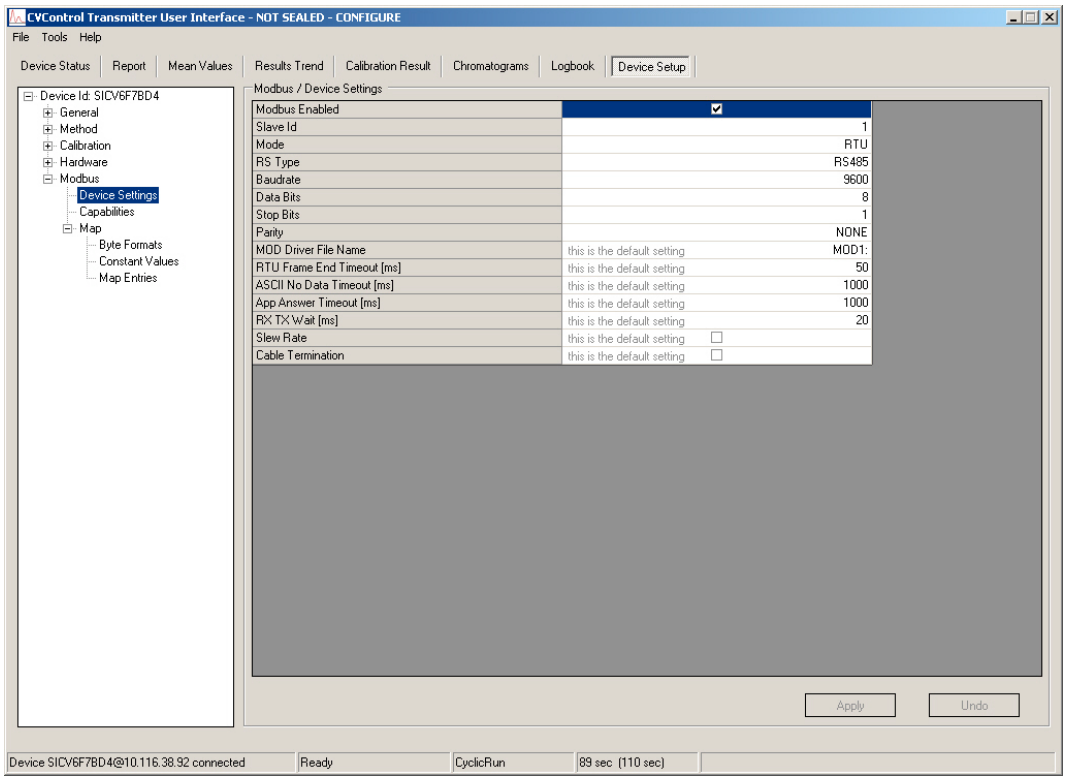
    This memory is structured in 16-bit registers which are accessed using addresses. The maximum address range is 0 to 65535.
  - Agreement on memory division

    During programming of the devices, the meaning of each register must be defined. The results of each component in each sample must be written by the chromatograph into a specific position of the process control system/flow computer memory. The process control system/flow computer can find the results there. These address declarations depend on the number of chromatographs, samples and components connected to the process control system/flow computer. These are therefore defined separately for each plant.

10.2 Changing MODBUS parameters

Procedure

1. Start the program "CVControl"
   (start bar **Start ➜ Programs ➜ Siemens AG ➜ CVControl ➜ CVControl**).
2. Open the tag "Device Setup" and the navigation area "Modbus".
   There are three setting options available here:
   – "Device Settings"
   – "Capabilities"
   – "Map"



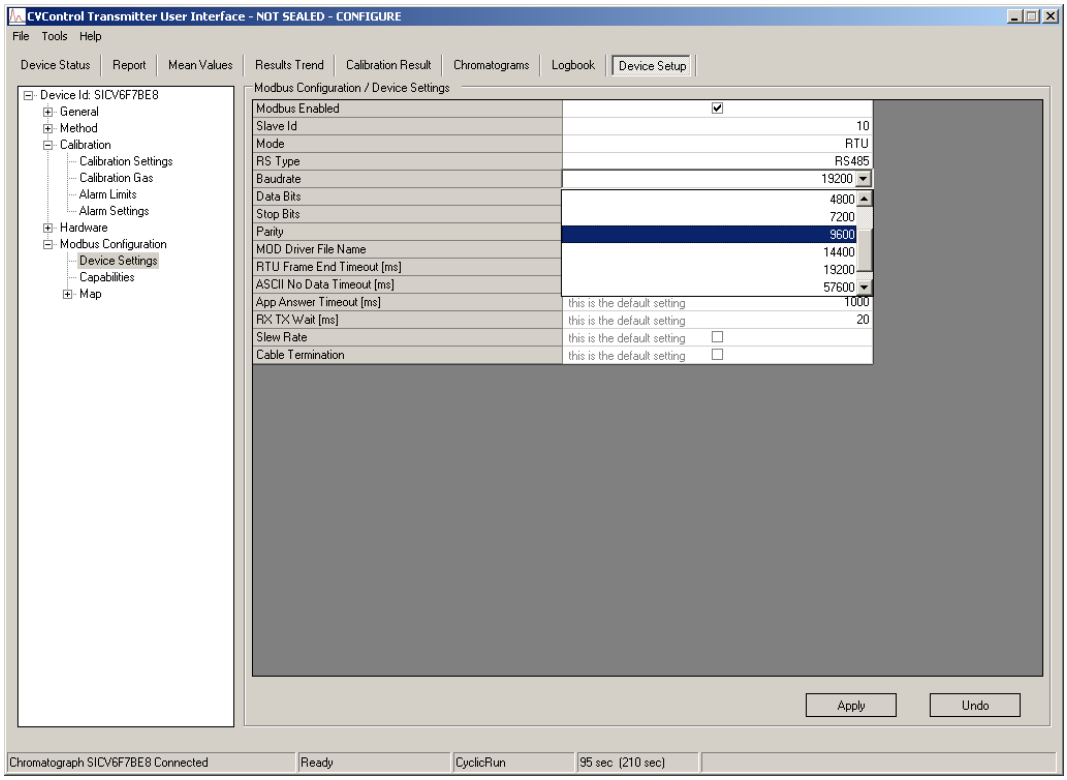
10.2.1 Interface specification with "Modbus Configuration"

10.2.1.1 Parameterizing interfaces with "Device Settings"

The procedure is described using an example with a transmission rate of 19200 bps.

Procedure

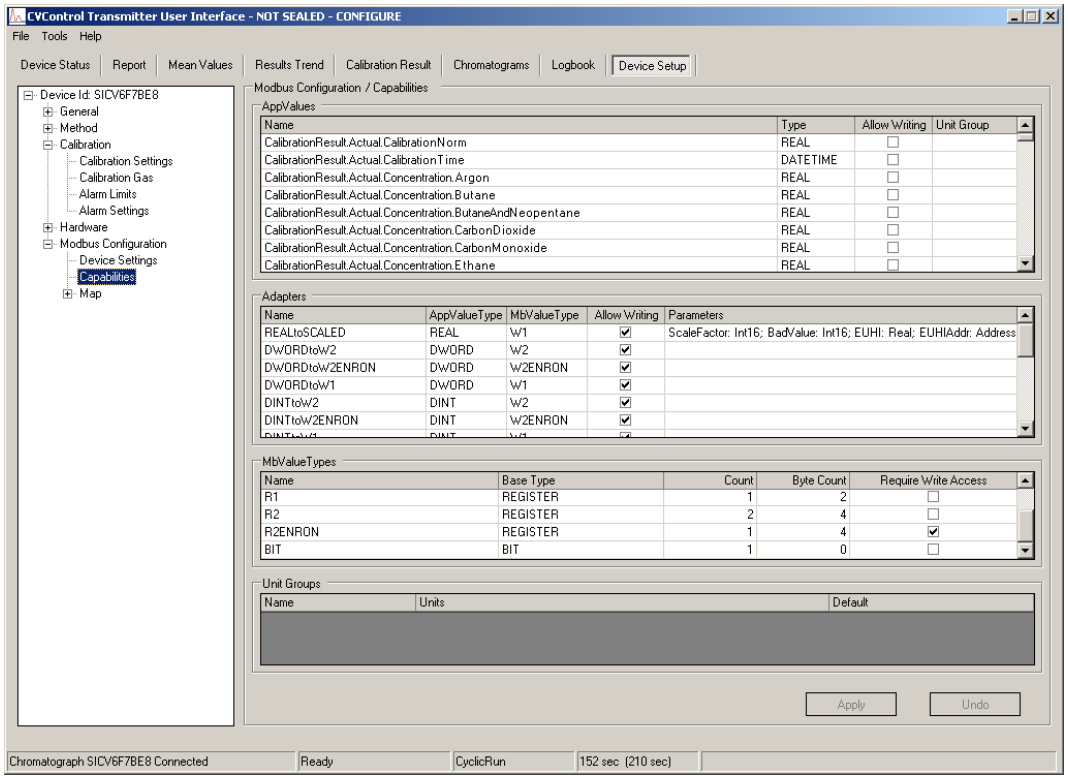
1. Select the desired "Baud rate" in the drop-down list in the dialog box "Modus Configuration/Device Settings".
2. Confirm your entries by clicking on "Apply". The settings will be saved in the gas chromatograph.



10.2.1.2 "Capabilities"

The following non-editable information is displayed in the property object "Capabilities":

- "AppValues"
- "Adapters"
- "MbValueTypes"



- "**AppValues**" contains all information which the device can provide with Modbus.
- "**Adapters**" maps data of the gas chromatograph ("AppValues") in Modbus-compatible data types and vice versa.

- "**MbValueTypes**" indicates the data types which can be displayed on Modbus.

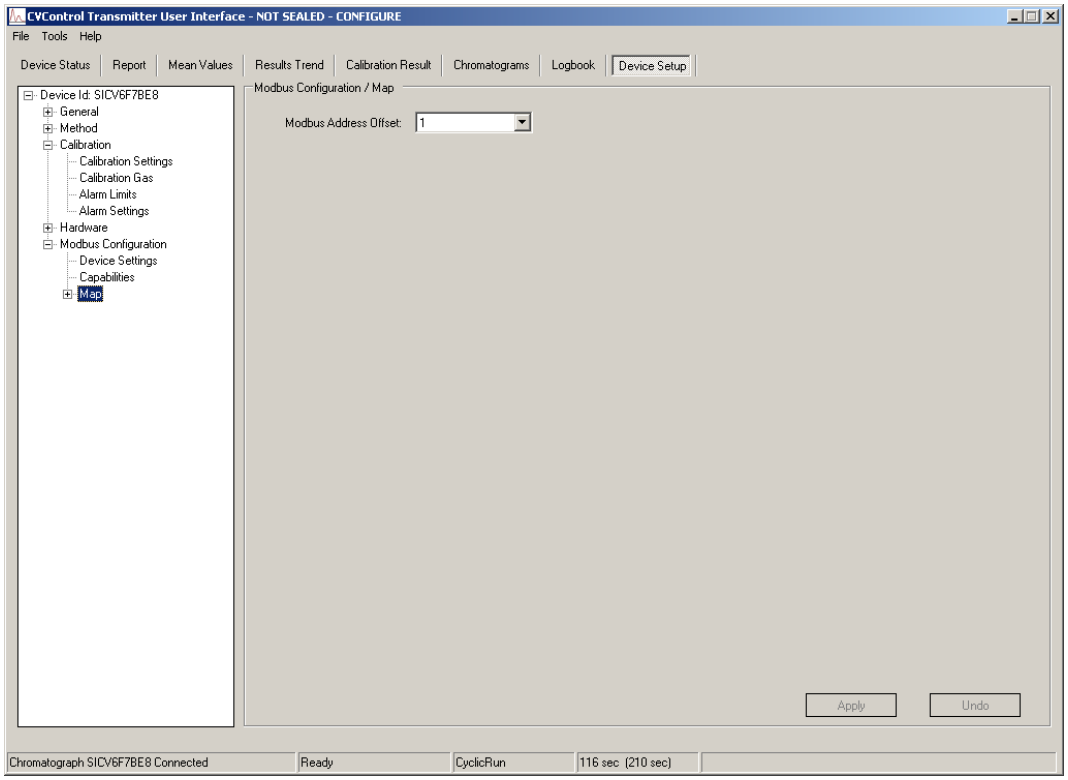
MbValueType	Interpretation	Type of access (write access)	Modbus protocol type
BIT	1 bit	FALSE	1 single input
BIT	1 bit	TRUE	1 coil
W1	16 bit integer (signed or unsigned)	FALSE	1 input register
W1	16 bit integer (signed or unsigned)	TRUE	1 holding register
W2	32 bit integer (signed or unsigned)	FALSE	2 input register
W2	32 bit integer (signed or unsigned)	TRUE	2 holding register
W2 ENRON	32 bit integer (signed or unsigned)	TRUE	1 holding register
R1	16 bit floating point (scaled EUHI not IEEE)	FALSE	1 input register
R1	16 bit floating point (scaled EUHI not IEEE)	TRUE	1 holding register
R2	32 bit IEEE floating point	FALSE	2 input register
R2	32 bit IEEE floating point	TRUE	2 holding register
R2 ENRON	32 bit IEEE floating point	TRUE	1 holding register

10.2.1.3 Parameterizing interfaces with "Map"

Using "Map" you define which application values are to be written into which address area.

You make a selection for the "Modbus Address Offset" in the dialog box "Map". The following drop-down menus are additionally available in the navigation area:

- "Byte Formats"
- "Constant Values"
- "Map Entries"



- You can shift the offset using the drop-down list "Modbus Address Offset".
- In the drop-down list you can select between 0 and 1:

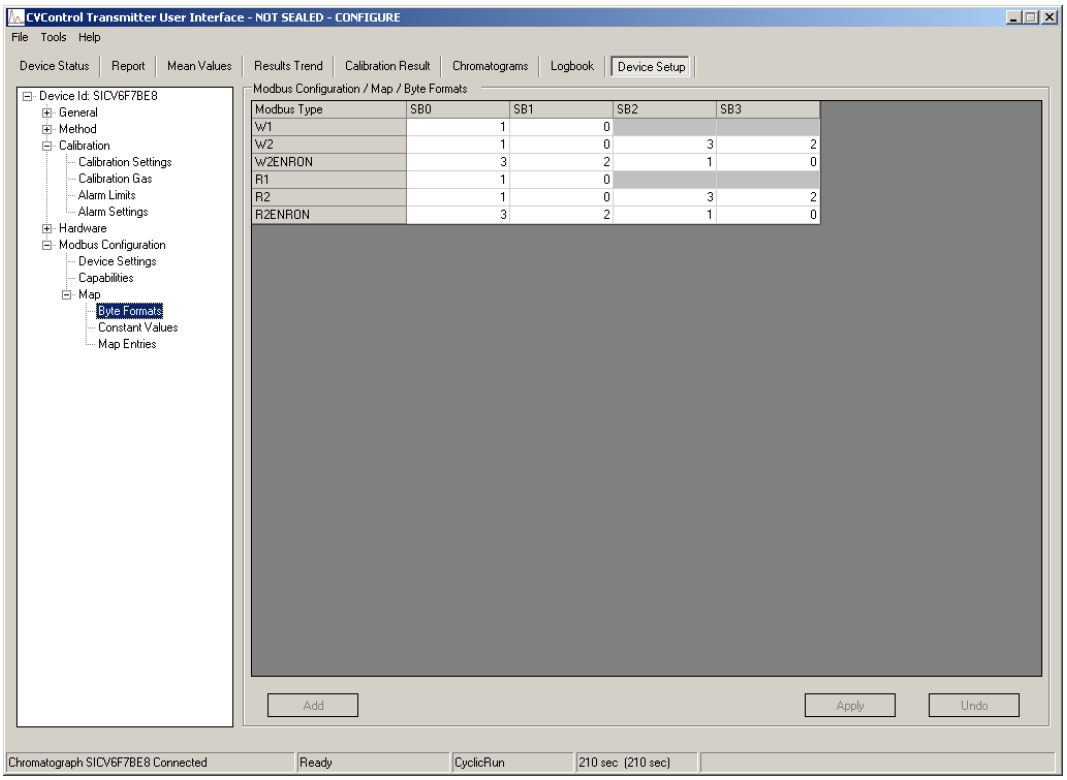
  0 ⇒ no shift of offset, e.g. start at 1000.

  1 ⇒ shift of offset by 1, e.g. start at 1001.

"Byte Formats"

In "Byte Formats" you can define the sequence and arrangement of a 16-bit or 32-bit register.

1. Click "Byte Formats" in the navigation area.
2. Enter your required values for "SB0", "SB1", "SB2" and "SB3" in the respective lines.



3. To confirm your inputs, click "Apply".

"Constant Values"

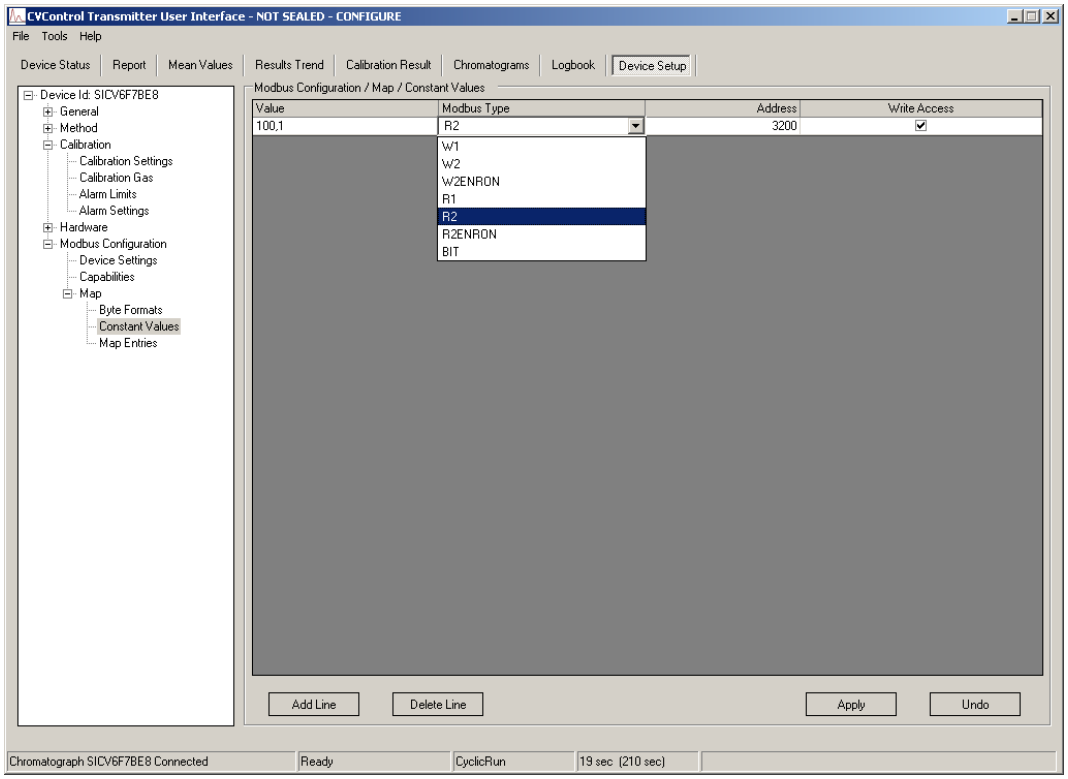
In this dialog box, set the constants to be transmitted with Modbus.

Example of a constant:

Value	Modbus Type	Address
100,1	R2	3200

1. Select "Constant Values" in the navigation area, and click the "Add Line" button in the dialog box.
2. Enter the constant under "Value", and select the "Modbus Type" and "Address".

   When assigning addresses, note the number of occupied registers, e.g. R2 occupies 3200 and 3201, R2 ENRON occupies only 3200.

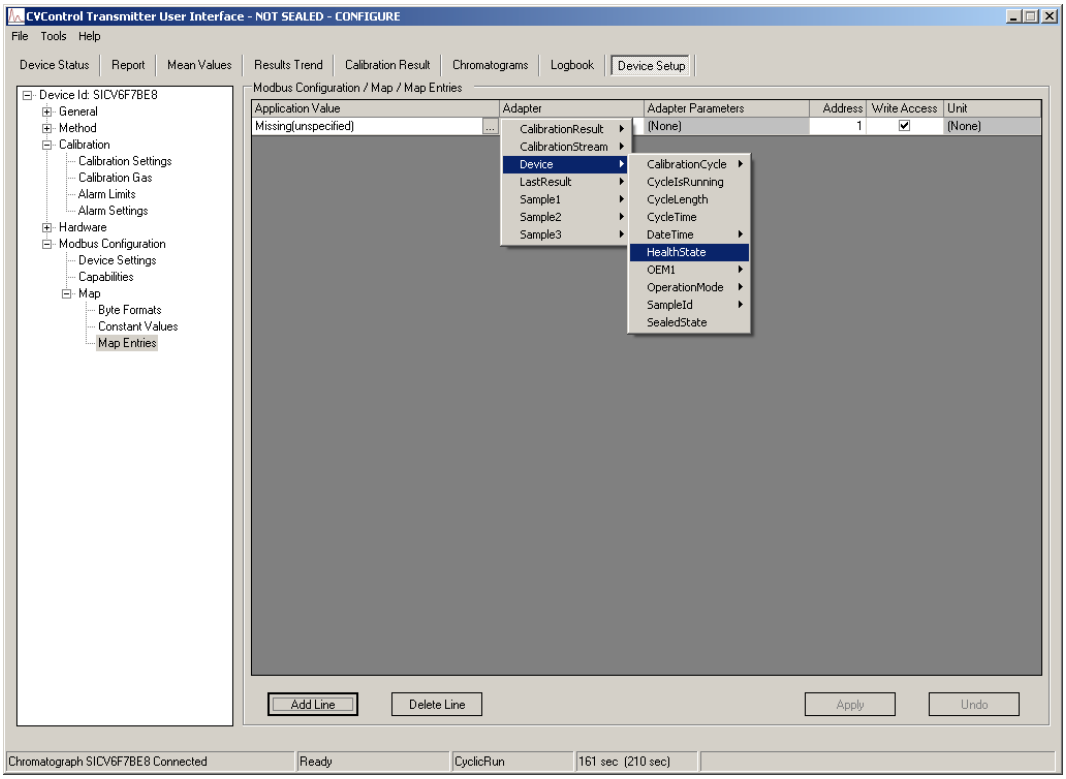


3. Confirm the input of all required constants by clicking on "Apply".

"Map Entries"

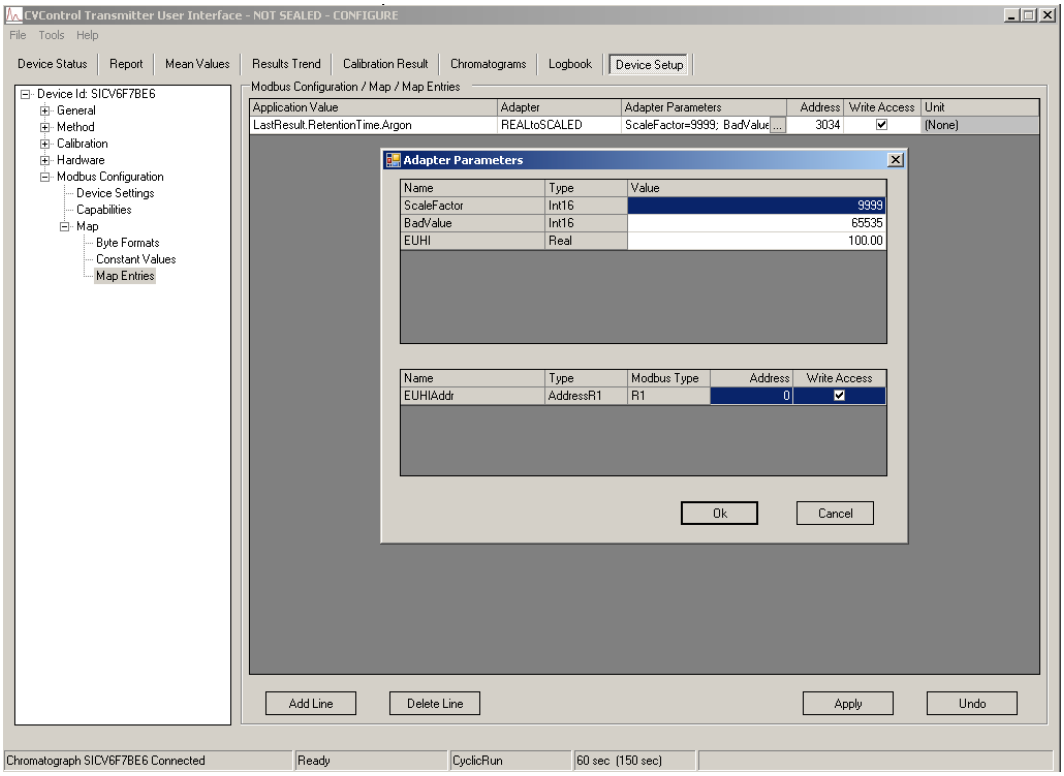
Use "Map Entries" to select the application values which you wish to transmit with.

1. Select "Map Entries" in the navigation area, and click the "Add Line" button in the dialog box.



2. In the dialog box, select in succession the desired value for "Application Value", e.g. "HealthState".
3. Select a suitable adapter.

4. Depending on the application, the parameters must be set under "Adapter Parameters".



5. Specify the register address.
6. Specify the access mode.
   - Write Access True (ticked) = Holding Register ➜ Coil
   - Write Access False (not ticked) = Input Register ➜ Single Input.
7. Sets the units for the results depending on the application.
8. To save the data in the gas chromatograph, confirm your inputs by clicking "OK" and "Apply".

10.2.2 Description of the application parameters

10.2.2.1 Device information

Device parameter	Values / value range	Description
Device.HealthState	0 = unknown, 1 = ready, 2 = warning, 3 = alarm	Current state of device.
Device.SealedState	value ! (value) = 0	Is correct if the device is currently in calibrated mode.
Device.DateTime.Read	Local time referred to time zone of device.	• Current date and time of device. • Readable
Device.DateTime.Write	Local time referred to time zone of device.	• Current date and time of device. • Writable
Device.OperationMode.Actual	0 = unknown, 1 = hold 2 = cyclic 3 = single run, 4 = calibration	Current operating mode of device.
Device.OperationMode.Next	0 = unknown, 1 = hold 2 = cyclic 3 = single run, 4 = calibration	• Current operating mode of device. • Writable
Device.SampleId.Actual	-1 = set stream, 0 = unknown 1 = sample stream 1 2 = sample stream 2 3 = sample stream 3	The number assignments of the streams currently being analyzed.
Device.SampleId.Next	-1 = set stream, 0 = unknown 1 = sample stream 1 2 = sample stream 2 3 = sample stream 3	The number assignments of the streams to be analyzed next.
Device.CycleIsRunning	value != 0	Correct if an analysis is currently running.
Device.CycleLength		Total duration of current analysis in seconds.
Device.CycleTime		Expired seconds since start of current analysis.
Device.CalibrationCycle.Current		Number assignment of analyses during calibration.

Device parameter	Values / value range	Description
Device.CalibrationCycle.Required		Number of analyses required for a calibration procedure.
Device.OEM1.Errors@3046		Only the 14th bit (Analyzer "Failure") of the gas chromatograph is used. If the device state changes to alarm, the 14th bit is set to 1.
Device.OEM1.Errors@3047	Always zero	
Device.OEM1.StreamMask@3035	Bit 2^n = 1 implies that sample stream "n" is connected.	"Masking" of sample streams combined with the table of components. (Bit 2^n = 1 means that sample stream "n" is connected). All bits are currently set to 1, for all sample streams.

10.2.2.2 General sample stream information

Applicable for "Calibration Stream", "Sample1", "Sample2" and "Sample3".

Sample stream parameter	Values / value range	Description
Sample1.Enabled	value != 0	• Correct if the sample stream is approved. • Writable

10.2.2.3 Result values

Result parameters	Values / value range	Description
Sample1.AnalysisID		Number representing the change for the last result of this sample stream.
Sample1.InjectionTime		Date and time at which the injection took place.
Sample1.OEM1.CalOrAnalysisFlag@3059	• 1 for all valve streams • 0 for the calibration stream	Value to differentiate between measurement and calibration.
Sample1.OEM1.NewDataFlag@3058	value != 0	• New data present. • Correct if a new result is available for this stream. • Writable: can be deleted to 0 by the reader "Modbus master".
Sample1.Status.Alarm	value != 0	Correct if an alarm occurs during the analysis.
Sample1.Status.DataNotValid	value != 0	Correct if the result is invalid.
Sample1.Status.Revision	value != 0	Correct if the revision bit switch was set for this result. The revision analysis does not contribute to the mean values.
Sample1.Status.Warning	value != 0	Correct if a warning has occurred during the analysis. This value is not currently set by the device.
Sample1.100PercentNorm		Standardization factor, see Section "Calculation formulae (Page 102)".
Sample1.Status.OutOfRange	value!=0	Is correct if the result is outside the expected range.

Component values

- Component values are the **area**, **concentration** and **dwell time**. These three values are available for each supported component.
- The operating software for the gas chromatograph supports 23 individual components and 3 group components.

Note

Not all of these components can be measured using all analysis modules.

Individual components

Acetylene	Ethane	2-Methylpropene
Air	Ethylbenzene	Neon
Ammonia	Ethylcyclohexane	Neopentane
Argon	Ethylcyclopentane	Nitrogen
Benzene	Ethylene	Nonane
1,2-Butadiene	Helium	Octane
1,3-Butadiene	Heptane	Oxygen
Butane	Hexane	Pentane
1-Butene	Hydrogen	1-Pentene
cis-2-Butene	Hydrogen cyanide	Propadiene
trans-2-Butene	Hydrogen sulfide	Propane
Carbon dioxide	Isobutane	Propylene
Carbon disulfide	Isopentane	Sulfur dioxide
Carbon monoxide	Krypton	Toluene
Carbonyl sulfide	Methane	Xenon
Cyclohexane	Methanethiol	o-Xylene
Cyclopentane	Methanol	Water
Decane	Methylcyclohexane	
2,2-Dimethylbutane	Methylcyclopentane	
2,3-Dimethylbutane	2-Methylpentane	
Dinitrogen monoxide	3-Methylpentane	

Group components

- Hexane Group
- Hexane and higher
- Heptane Group
- Heptane and higher
- Octane Group
- Octane and higher
- Nonane Group
- Nonane and higher
- ConfigurableGroup 1
- ConfigurableGroup 2
- ConfigurableGroup 3
- ConfigurableGroup 4
- ConfigurableGroup 5
- ConfigurableGroup 6

The component values are specified in the following manner:
[<stream name>.<component value type>.<component name>]

In addition, the non-standardized values of the individual components can be scanned:
[<stream name>.ConcentrationRaw.<component name>]

Calculated values

The gas chromatograph calculates 7 values, see the following table.

Parameter for the calculation	Calculated value
Sample1.CV.Inferior	Heating value
Sample1.CV.Superior	Calorific value
Sample1.CV.WobbeIndex	Wobbe index
Sample1.CV.Density	Density
Sample1.CV.RelativeDensity	Relative density
Sample1.CV.CompressionFactor	Compressibility factor
Sample1.CV.UnnormalizedTotal	Non-standardized total

10.2.2.4 Mean values

The concentrations of all components and the calculated values are combined as mean values and saved by the device. Four different types of mean values are available:

- Hourly mean values **"MeanHour"**
- Daily mean values **"MeanDay"**
- Monthly mean values **"MeanMonth"**
- A variable mean value interval **"MeanVariable"**

The variable interval can be set such that up to 744 values of "MeanHours" can be combined.

The mean values for the last completed interval of each type are made available by the gas chromatograph in the following manner:

[<Name Product stream>.< Mean value type >.Concentration.<Component name>] and [<Name Product stream>.< Mean value type >.CV.<Name of calculated value>].

Examples:

- Sample1.MeanDay.Concentration.Hexane
- Sample1.MeanMonth.CV.WobbeIndex

Furthermore, the number of combined analyses for each type of mean value is made available in the following form:

[<Name Product stream>.< Mean value type >.Number of analyses]

Example: Sample1.MeanHour.AnalysisCount

The number of hours for the variable average interval is also available as "Sample1.MeanVariable.IntervalHours".

10.2.2.5 Result of the last analysis

- A further result range is available which saves all result values of the last analysis independent of the product stream number.
- Each time a new result is available for one of the four product streams, the values of this area are also updated.

Examples:

- LastResult.AnalysisId
- LastResult.Status.DataNotValid
- LastResult.Concentration.Butane
- LastResult.OEM1.NewDataFlag@3058
- LastResult.Status.Alarm

The gas chromatograph provides a value as additional information which saves the sample stream number of the last result: "**LastResult.Sampled**".

10.2.3 Data backup and restoration

1. Start the program "CVControl"
   (start bar **Start** ➜ **Programs** ➜ **Siemens AG** ➜ **CVControl** ➜ **CVControl**).
2. Select the tab "Tools".
   - **Save** the **data** for the gas chromatograph using the menu commands: "Save Modbus Device Settings" and "Save Modbus Map".
   - **Load** the **data** for the gas chromatograph using the menu commands: "Load Modbus Map" and "Load Modbus Device Settings".

Alarm, fault and system messages

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The fault and alarm messages are listed below which the gas chromatograph displays in the tab "Device Status" in the box "Active Alarms and Warnings" and which are recorded in the logbook.

General alarms

- CRC error:

  Only occurs in "Sealed Mode". Occurs if the current method does not provide the expected checksum. Indicates a change in the method due to hardware faults (Flash memory) or manipulation.

- Method error:

  Occurs if parts of the current method cannot be interpreted.

- SampleStream Alarm:

  The DI for the sample stream test has not been set (typically DI1).

- Modbus Alarm:

  Occurs if the current Modbus configuration cannot be interpreted.
  Occurs if the serial interface is not used by Modbus.

Hardware alarms

- Heartbeat lost:

  Internal communication interrupted

- Heartbeat dead:

  Internal communication aborted

- Communication error:

  Communication error due to wiring or software fault.

Detector alarms

- **Internal deactivated**:

  Gas chromatograph deactivated
- **Sensor shortcut**:

  Short-circuit in sensor
- **Sensor interrupted**:

  Interruption in sensor
- **No gas supply:**

  Gas supply interrupted.
- **Data Cycle lost**:

  Occurs if the data transmission from the RSP (trace data from a detector) is intermittent. Trace data are replaced by baseline data in the corresponding period.
- **Data Phase lost**:

  Occurs if the synchronization of data transmission (trace data from a detector) with the RSP was faulty.

Pressure alarms

- **Internal deactivated**:

  Gas chromatograph deactivated.
- **A/D failure**:

  A/D converter failure:
- **Low supply pressure**:

  Supply pressure is low.
- **Pressure out of limits**:
  Pressure violates the range limits.
- **Supply pressure out of limits**:

  Supply pressure outside the range limits.
- **Pressure out of control**:

  Pressures out of control.
- **Voltage out of control**:

  Power supply out of control.
- **No gas supply**:

  Gas supply interrupted.

Valve alarms

- **Flashloop faulty**
- **Sample faulty**
- **Backflush faulty**
- **Injection faulty**

Temperature alarms

- **Control error**
- **RTD error**
- **Deviation exceeded**
- **Internal deactivated**:
  Gas chromatograph deactivated.
- **No gas supply**:
  Gas supply interrupted.

Calibration alarms

- **Unspecified Error:**

  An unspecified error has occurred.

- **Analyses out of limits:**

  The concentration of one or more components determined during a single relevant calibration analysis is outside the range specified by "Calibration Limits". A relevant analysis is one that is used to determine the response factor.

- **Calorific values out of limits:**

  Only occurs in "Sealed Mode". The calorific values calculated from the calibration analyses (with the current response factors) are outside the specified range.

- **Difference to sealed calibration:**

  Only occurs in "Sealed Mode". Occurs if the concentrations calculated using the response factors of the sealed calibration are outside the specified range compared to the concentrations of the current calibration gas.

- **Difference to last calibration:**

  Only occurs in "Sealed Mode". Occurs if the concentrations calculated using the response factors of the previous calibration are outside the specified range compared to the concentrations of the current calibration gas.

- **Optimization of CycleEvents failed:**

  Optimization of the CycleEvents has failed. A common cause is the non-recognition of a peak required for optimization.

- **Optimization of IntEvents, Peaks and Groups failed:**

  Optimization of the IntegrationEvents, Peaks and Groups has failed. A common cause is the non-recognition of a peak required for optimization.

- **Reached Calibration timeout:**

  The maximum permissible duration for a calibration has been reached.

- **Reached maximum number of failed calibrations:**

  The maximum permissible number of failed calibrations has been reached.

Service and support 12

Worldwide contact partners

If you have any further questions relating to the products described in this documentation, contact your local representative at the Siemens office nearest you.

You will find information on whom to contact at this Internet address www.siemens.com/automation/partner (www.siemens.com/automation/partner).

Product information on the Internet

The instructions are included on the CDs which are already supplied or may be ordered. In addition, the instructions are available on the Internet on the Siemens homepage.

A signpost to the range of technical documentation, the online catalog, and the online ordering system for individual products and systems is available at www.siemens.com/processanalytics (www.siemens.com/processanalytics).

Here you will find:

- Products & solutions, including our newsletter containing up-to-date information on your products.
- Electronic trading over the Internet.
- Support with e.g. instructions and manuals, certificates, brochures and catalogs.

Training center

Siemens offers corresponding courses for newcomers to process gas chromatography. Please contact the central Training Center in Karlsruhe.

Training Center Europe
Process Instrumentation and Analytics
Siemensallee 84
D-76181 Karlsruhe, Germany
Internet: www.sitrain.siemens.com (www.sitrain.siemens.com)

Technical support

- You can access technical support for all I IA & DT products using:
  - The Web form for "Support Request" at www.siemens.com/automation/support-request (www.siemens.com/automation/support-request).
  - Phone: +49 180 5050 222
  - Fax: +49 180 5050 223
    (0.14 € / min from German landline, mobile charges may differ)
- You can find the latest information concerning your device on the Internet at www.siemens.com/automation/ (www.siemens.com/automation/).

List of abbreviations

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Abbreviation/symbol	Explanation
°	Degrees
°C	Degrees Celsius
%	Percent (hundredth part)
A/D	Analog/digital
AGA	American Gas Association
Bit	Binary digit
ca.	Approx.
CAC	Communication and analytical control
CD	Compact disk
CF	Calibration factor
CH_4	CH_4 = methane
cm^2	Square centimeter
CO_2	CO_2 = carbon dioxide
CRC	Cyclic redundancy check, an error detection procedure used for data processing
CSV	File format, abbreviation for comma separated values or character separated values.
CV	Calorific value
DC	Direct current
Dens	Density
DVD	Digital versatile disk
e.g.	For example
EIA	Electronic Industries Alliance
EPC	Electronic pressure controller
ETC	Electronic temperature controller
ff.	and following (e.g. pages, paragraphs)
IEEE	Institute of Electrical and Electronics Engineers
IP	Internet Protocol
ISO	International Organization for Standardization
J	Joule
kg	Kilogram
kPa	Kilopascal
l	Liter
LED	Light emitting diode

Abbreviation/symbol	Explanation
m	Meter
m^3	Cubic meter
max.	Maximum
MB	Megabyte
mbd	File format, abbreviation for Maxum binary data
Mbit	10^6 bits
MHz	Megahertz
min	Minute
MJ	Mega joule
ml	Milliliter
MMI	Man-machine interface
Mol	Mol is the SI base unit for amount of substance
MPa	Megapascal
PC	Personal computer
PTB	Physikalisch Technische Bundesanstalt (German Technical Inspectorate)
RAM	Random access memory
RF	Response factor
ROM	Read only memory
RS	Recommended standard
RS-232	(also EIA-232) Identifies an interface standard for a sequential, serial data transmission
RS-485	(also EIA-485) Identifies an interface standard for a differential, serial data transmission
RSP	Real-time signal processing
RTD	Resistance temperature detector
s	Second
TCP/IP	Transmission Control Protocol/Internet Protocol; a reference model for communication on the Internet
V	Volt
V (n.n.n)	Version (with version number)
VC_CH	Valve

Glossary

AGA, AGA-8

Abbreviation for **A**merican **G**as **A**ssociation. This is an amalgamation of companies producing and processing natural gas.
AGA-8 is a standardized algorithm for calculating the gas density.

Backspace

The backspace is a key on the PC keyboard which shifts the cursor back by one position when pressed, and deletes the character present there. This corresponds to the "correction key" function on a typewriter.

Calorific value

The calorific value (formerly referred to as gross calorific value or higher heating value) is a measure of the thermal energy contained in a specified amount of material. The calorific value of a fuel specifies the amount of heat generated upon burning of the fuel with subsequent cooling of the combustion gases down to 25 °C with release of condensation.

Combustion gas

Combustion gas is a flammable gas that is mainly or frequently used as fuel. The most well-known combustion gas nowadays is natural gas.

Compression factor

The compression factor (also referred to as compressibility factor, real gas factor or real factor) describes the deviation of the behavior of a real gas from that of an ideal gas.

For ideal gases, the compression factor = 1, as derived from the ideal gas law. However, simplifications have been included in the law which only correctly describe the response of gases in limit cases - at low pressures, high temperatures, and volumes tending toward infinity. With real gases, the compression factor therefore deviates from 1.

Density

See gas density.

Ethane

Ethane is a chemical compound belonging to the group of alkanes (saturated hydrocarbons). It is a colorless and odorless gas with the formula C_2H_6. Ethane is primarily used for heating and combustion purposes. Ethane is a main component of natural gas, in addition to methane.

Ethernet

Ethernet is a fixed-cable data network technology for local area networks. It enables data transfer in the form of data frames between all devices that are connected in a local area network, e.g. computers, printers. Ethernet covers definitions for types of cables and connectors, describes the signaling for the physical layer, and defines packet formats and protocols.

Firewall

A firewall, also referred to as a network or hardware firewall, is a network security component in information technology which permits or prohibits network traffic using defined directives. The objective of a firewall is to protect the data traffic between network segments according to various levels of trustworthiness. A typical application is to control the transition between a local network (high trustworthiness) and the Internet (no trustworthiness).

Gas density

The gas density ρ specifies the mass of gas present in a defined volume.

GC: Gas chromatography

Gas chromatography is an analytical method used worldwide to separate mixtures into individual chemical compounds. GC can only be used for components which are gaseous or can be vaporized. With this type of chromatography, an inert gas is used as the mobile phase, usually nitrogen or helium. The carrier gas is passed through a tube or capillary with a defined internal diameter, the so-called "column". Older columns are made of metal, newer columns of quartz glass which are coated to increase the resistance to breakage. The column is internally lined with a defined stationary phase, frequently with viscous polysiloxanes.

GOST (ГОСТ)

Russian: Gosudarstvennyy Standart (GOST), in original 'Государственный Стандарт', translated "Government standard" is the soviet (at time of former USSR) or Russian standard.

ISO

Abbreviation for **I**nternational **O**rganization for **S**tandardization . This is the international association of standards organizations, and processes international standards in all sectors with the exception of the electrical and electronics industries for which the International Electrotechnical Commission (IEC) is responsible, and the telecommunications industry for which the International Telecommunications Union (ITU) is responsible. Together, these three organizations comprise the WSC (World Standards Cooperation). The ISO headquarters is in Geneva (Switzerland).

Modbus

The Modbus protocol is a communications protocol based on a master/slave or client/server architecture. The Modbus protocol was defined by Modicon in 1979 for communication with its programmable controllers. Modbus is a de facto standard in industry, since it is an open protocol.

Modbus is used to connect a master (e.g. a PC) and several slaves (e.g. measuring and control systems). There are two versions of Modbus: one for the serial interface and one for Ethernet.

Non-standardized values

Concentrations prior to 100% standardization

Process gas chromatography

Process gas chromatography:

- Is one of the most powerful measuring and analysis methods for process engineering.
- Is a procedure which is both discrete and extractive.
- Is frequently used for online monitoring of processes since the sequences are easy to automate and a large number of components can be measured simultaneously.
- Can be used to separate and quantify the components of almost all homogenous gaseous or liquid mixtures. It must be possible to vaporize the liquid components without decomposition.
  The individual components of a discrete sample pass through the column system at different velocities, and are recorded in succession by a detector.
  The time between sample introduction and recording of a substance at the detector (the retention time) is characteristic of the substance and is used to identify it. The magnitude of the detector signal is a measure of the volume concentration of the component in the gas.

Retention time

In contrast to the carrier gases, most chemicals interact with the stationary phase, i.e. they are retained in the stationary phase for a certain length of time. Their duration in the stationary phase is added to the duration in the mobile phase (dead time), and they therefore require longer to pass through the complete GC column. The term "Retention" was formerly used to indicate that the stationary phase retains the components in the sample stream for a certain period. Nowadays the term is simply used to describe the time required by the components in the sample stream to pass through the column, and therefore includes the dead time. The terms are therefore defined as follows:

- *Retention time*: Time required by the components in the sample stream to pass through the column. This corresponds to the time which passes between injection and detection [$t_R = t_s + t_0$].
- *Net retention time*: Time for which the components in the sample stream are retained in the stationary phase [t_s].
- *Dead time*: Time for which the components in the sample stream are retained in the mobile phase [t_0].

Volume conversion device

The volume conversion device is a measuring instrument for calculating the gas volume flow at standard conditions derived from the measurement in the operating state.
The volume conversion device determines the volume flow at standard conditions of the medium to be measured based on the quantity measurement in the operating state and its temperature and pressure. The quantity determined in this manner is specified in Nm³. The work can then also be determined by multiplying with the specific calorific value.

Wobbe index

The Wobbe index (also known as the Wobbe value or Wobbe number) provides information about the quality of combustion gases with different compositions (such as natural gas and town gas). The Wobbe index is a corrected heating value (calorific value) and is calculated from the quotient of the heating (calorific) value and the root of the fuel/air density ratio.

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Siemens AG
Industry Sector
Sensors and Communication
P.O. Box 48 48
D-90026 NUREMBERG
GERMANY

Subject to change
A5E01428676-03
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